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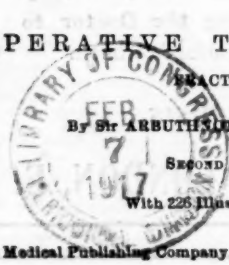

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BY COLONEL CHARTERS J. SYMONDS, C.B., A.M.S., M.S. LOND., F.R.C.S. ENG.,

A VICE-PRESIDENT OF THE COLLEGE; CONSULTING SURGEON TO GUY'S HOSPITAL; CONSULTING SURGEON TO HIS MAJESTY'S FORCES.

MR. PRESIDENT, LADIES, AND GENTLEMEN,—Gunshot wounds of the spinal cord form one of the most fatal groups of battle injuries. It is stated that in the Spanish-American War the mortality was 75 per cent. higher than injuries of any other region of the body. According to Surgeon-General W. F. Stevenson, 58·3 per cent. of the cases in the Boer War died, and when there was actual lesion of the cord with fracture of the arch the death-rate was 75 per cent. Many die on the field, either from the injury to the cord in the cervical region or some associated injury when other parts in addition to the spine are hit. Of those who survive to reach the base hospitals, probably the majority succumb to the effects of renal infection within a few weeks; taking the cases admitted to one military hospital—Netley—in the five months beginning July 1st last, there were 28 deaths in 43 dorsal and lumbar cases.

Of those who escape early death, some remain helpless from paraplegia, with incontinence of urine and fæces, and sooner or later die from the effects of renal infection. A few, where the trunks of the cauda equina have been injured, recover more or less power in proportion to the immediate injury. Some of these recover control of the bladder and are able to shuffle about or walk a few miles with support. There are those who, beside the paralysis, suffer pain for many months, often to an unbearable degree. Only in the concussion cases of the cord itself does any complete recovery ensue.

My object to-day is to consider how far operative methods can bring relief in these distressing cases; whether the advances in diagnosis, in technique, and in the improved opportunities for operation have enabled us to ameliorate the fate of these men. Certain of the effects of gunshot injuries are altogether beyond our help; there are others where more or less benefit may result from operation; and there are not a few where operation may prevent the onset of serious complications.

The accounts given by Surgeon-General Stevenson and by Surgeon-General Sir G. H. Makins of the South African War are not encouraging; few operations were performed and little benefit was observed. Possibly the fear of aggravating the condition led surgeons to refrain from operation where some good might have resulted. On the other hand, unsuitable cases may have been submitted to operation which now would be left alone.

The function of the cord may be destroyed in the following ways by gunshot wounds. The missile—bullet or shell-fragment—may traverse and lacerate the structure, rendering recovery to a useful extent impossible. The bullet, on account of its high velocity, may produce by a concussion effect an acute necrosis of one or more segments without actually coming in contact with the cord. Fragments of the laminæ may be driven in, producing laceration and compression. The missile may be lodged in the canal external to or within the theca and continue to exert injurious influences. Extravasated blood as a compressing force does not appear to have been encountered by Makins and others in the South African campaign, and I have not found compression from this cause in those operated upon by myself and others associated with me. Extravasation into the substance of the cord has been found, and as such is unrelievable by any operation.

Of the foregoing conditions, indriven bone fragments and lodged missiles may be removed by operation. The damage inflicted so far as the cord itself is concerned cannot be undone, nor can it be mended by any surgical means. The most that can be expected of operation is that the removal of obvious sources of irritation and pressure places the parts in a better condition for recovery. In the cauda equina, where we have to deal with nerve trunks, capable, like peripheral nerves, of recovery from bruising, and of union with restoration of conductivity, surgery holds out a more hopeful prospect.

Gunshot injuries of the spine and cord fall, like wounds elsewhere, under two heads. First, the open septic wound with fracture of the spinous processes and laminæ, associated with more or less injury to the cord; and secondly, the closed wound where sepsis is absent.

OPEN AND SUPPURATING WOUNDS.

Let us consider the treatment of the open septic wounds—in other words, of compound fractures of the spine. It would seem almost superfluous to insist upon the necessity of dealing with these cases on ordinary lines as soon as possible. The fact that a fair number requiring operation reach our home hospitals leads me to think that an operation on any kind of spinal injury is considered by many as one demanding special knowledge. This is true enough where the wound has closed and a full laminectomy is required, but in these septic wounds it is seldom necessary to remove any sound bone, and the undertaking can hardly be called a laminectomy.

In dealing with these septic wounds it is most important to keep to the track of the wound, enlarging in any direction sufficiently to obtain access to its deepest part; no formal incision should be made, and when the injury is unilateral the sound side should not be interfered with. My experience is somewhat limited, but I have not found it necessary to remove a sound lamina nor to interfere with the sound half of the arch. In a case under another surgeon, however, a lamina had to be removed to permit the extraction of a fragment of shell.

Should the dura mater be found punctured or cerebro-spinal fluid escape no grave consequences need ensue. If the wound be treated by the open method meningitis is unlikely to occur. It may be necessary where the dura is widely lacerated to remove fragments of bone or metal from within the theca, and yet fatal meningitis may not occur. I am strongly of opinion that these wounds should be treated after careful irrigation by loose cyanide gauze packing, or by the salt pack if preferred, and left open. Excision and closure, I believe, more often fails than succeeds, except, perhaps, in the hands of a very few. In two recent operations communicated to me there was wide suppuration, followed by meningitis and death in one. The fatal issue not occurring till the sixteenth day suggests that free drainage from the first would probably have prevented this result, even though septic shell fragments had been removed from beneath the dura. (Case 1.)

It can never be necessary to open the dura in these cases if found uninjured. Blood has not been found in sufficient quantities to cause compression, and any thought of suture of the trunks of the cauda equina must be dismissed. If intrathecal pressure is suspected a lumbar puncture, if it can be made away from the wound, should give relief. In dealing with these wounds no difference should be made between complete transverse lesions and the partial injuries; all require attention.

I cannot refrain from taking the opportunity of condemning—as a result of a fairly wide experience—the practice of excising septic wounds. Within a few hours of infliction and in capable hands the method may succeed. Of the cases arriving in Malta from the Dardanelles and those now coming from France, in the majority the attempt has failed. I could relate many disasters in wounds of the head and soft parts, and all surgeons at the base hospitals at home must be familiar with the necessity of removing sutures, opening the wounds, and releasing confined pus. It is, I am convinced, a thoroughly bad practice, and, as more harm than good results, should, I think, be abandoned. From what I have seen I would make one exception only, and that is of head injuries. Where the wound is recent, practically free from infection, and the operator understands the method of aponeurotic flap-making, I have seen some splendid results, and one has only to read the accounts of Colonel Percy Sargent, Major A. J. Hull, and others to learn what can be done; but then we are not all such skilled workers or possessed with such sound judgment, nor all Harvey Cushings.

From amongst some recent cases I select the following examples :—

CASE 1.—In a case operated upon 13 days after the injury a large septic fragment was found impacted in the canal, requiring the removal of an additional lamina for its extraction. Two smaller pieces were also found and removed. The cauda equina was much injured and cerebro-spinal fluid escaped. The wound was excised, sutured, and drained. Sixteen days later the patient died from meningitis.

In the judgment of those responsible for the treatment of this case it had been thought wiser to delay operation until the septic condition of the wound had been reduced. The wisdom of this course is open to question, so is the closure of the wound. Major Graham Simpson, who operated, and Lieutenant H. A. Wilson, under whose care the patient was admitted, both agree in this view. One other lesson is to be learnt from this case—viz., the resistance of the spinal meninges to infection. Here was a piece of shell, foul-smelling on removal from amongst the nerve roots of the cauda, where it had lain for 13 days, and yet there were no general signs of meningitis.

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CASE 4.—Showing laceration of the cord by two small fragments of shell. A piece of khaki is seen filling the upper part of the gap.

CASE 2.—For the notes of this case I am indebted to Captain D. F. Shearer. The missile had traversed the third lumbar vertebra, breaking the spinous process and right lamina. The wound was opened up; the fragments and left lamina removed. There was a copious flow of cerebro-spinal fluid from a puncture in the theca. The wound was excised, partially closed, and drained. For five days the temperature was raised, and free suppuration ensued. The case has proved to be one of concussion, as shown by the rapid return of power in the legs. Cerebro-spinal fluid continued to escape for more than three weeks, with no untoward signs except headache.

CASE 3.—Another patient was not obtained for operation till 40 days after the injury. The evacuation of several suppurating foci in the muscles, and the removal of bone fragments lying on the dura gave immediate relief to the pain in the legs which had existed from the time of the injury, and had required the almost constant use of morphia.

CASE 4.—Captain H. W. Kaye has given me notes of the findings at an autopsy made five days after the infliction of the wound. The specimen before you and the drawing (Fig. 1) show the laceration of the cord, and the embedded portions of clothing, carried in by two very small metal fragments. The cause of death was suppurative meningitis. While no permanent good would have resulted from early operation, it was nevertheless the right thing to have done.

All these observations point to the necessity of early exploration of septic wounds in direct connexion with the spine, keeping, as far as possible, to the infected area. It will seldom be necessary to remove more than the fragments of bone to relieve the pressure or reach the missile. Excision and closure where sepsis is established lead to wide suppuration and may determine a fatal issue. It is better to pack lightly with cyanide or iodoform gauze, or to dress with the salt pack.

CLOSED WOUNDS.

When the wound has closed and an aseptic operation can be carried out the question of the removal of bullets and shell fragments arises. In complete transverse lesion operation is only admissible for the relief of pain. A lodged bullet or fragment may cause untold misery. Removal may render the remaining weeks or months bearable. Operation wounds heal well, and respiratory difficulties if present can be met by local anæsthesia.

Where evidence of conductivity of the cord exists, is it necessary or wise in all cases to attempt removal of lodged missiles and bone fragments? If so, should this be done as soon as the wounds have closed, or should an interval be allowed to determine how far spontaneous recovery is possible? A lodged missile may be injurious in itself, as, for example, if it lies amongst the nerve trunks of the cauda equina or if it be pressing on a spinal nerve in the intervertebral foramen. On the other hand, the depressed fragments upon which the bullet lies may be doing harm. The bullet may have penetrated, fracturing and driving in the bone. Or, again, the bullet may have passed through the canal, entering by an intervertebral foramen and become lodged in the body of a vertebra where it is harmless. It may or may not have carried in a fragment of bone. These remarks apply chiefly where the missile enters from the back. Occasionally a shrapnel bullet may enter the vertebral body from the side, and beyond giving rise to symptoms of concussion may be quite harmless.

In considering the amount of benefit likely to arise from the removal of missiles and bone fragments, one at the outset must observe that the chief cause of the damage is the striking force. This cannot be undone; we can only, as stated earlier, by removing sources of possible irritation and pressure, promote the recovery of injured structures. It may be taken as the rule that when the missile enters from behind the arch is broken and fragments are driven inwards, whether it be lodged or not. Occasionally a bullet, usually a shrapnel, but in one case to be mentioned a rifle bullet, may enter through an intervertebral foramen, without carrying in bone fragments. It is important to recognise this fact of displacement, because the X rays do not always show the fragments.

If indriven bone be left, what injurious effects may result? This question cannot be answered satisfactorily until we possess observations made some time after the injury. I am able to contribute one such observation to-day. (Case 8.) The specimen (Fig. 5) was removed nine weeks after the injury. It shows a fragment of bone embedded in the nerve trunks of the cauda equina. The bone surrounded by new material is closely adherent to the nerve roots. The appearances suggest a progressive irritation, which must have, had the patient survived, interfered with recovery.

Thorburn in his monograph describes a case where dense fibrous tissue was found embedding the nerve roots of the cauda. Major Soutar, of the Red Cross Hospital, Netley, has communicated to me particulars of a case where the fibrous tissue was so dense that he was obliged to abandon an attempt to free the nerve roots. In a case published in the *Journal of the American Medical Association* for April last a portion of a bullet was found surrounded by two solid scars. In five cases of suppurating wounds recently operated upon at Netley fragments of bone were in two removed from within the theca, and in three from the surface of this membrane. in one aseptic operation a bullet and fragments of bone were found pressing the theca to one side. In another instance fragments were successfully removed from within the sheath, together with a small piece of shell.

The answer, it seems to me, to the two questions I have just asked, is that operation should be undertaken when evidence of continuity of the cord exists, and that the sooner it can be done after the injury the better. One presumes that care will be taken to exclude cases of concussion, and that careful consideration will be given to the general condition.

The following cases illustrate the foregoing remarks:—

CASE 5. *Removal of shrapnel bullet.*—Private ——, aged 29, was hit by a shrapnel bullet in the back on August 2nd, 1916, near Albert. Eight days later, on the 10th, he was admitted to the Royal Victoria Hospital, Netley, under the care of Captain Fergus Hewat, to whom I am indebted for the notes and the accurate account of the symptoms. There was an entrance wound over the eighth left interspace four inches from the posterior median line, but no exit wound. There was retention of urine and incontinence of fæces, no voluntary movement in the lower limbs, though muscular twitchings were seen at times and the legs were noticed to move unknown to the patient. There was reaction of degeneration in the muscles of the legs, but very slight in those of the thighs. The knee-jerks were absent; pin-prick sensation was lost on the front and outer aspects of both thighs; it was retained on the outer side of the legs and dorsum and soles of the feet, and in this last situation there was hyperæsthesia. The scrotum retained sensation. X rays showed a shrapnel bullet slightly above and to the left side of the spinous process of the eleventh dorsal, with evidence of fracture of this vertebra. (Fig. 2.) After a few days the retention disappeared, a catheter being no longer required; the urine passed every five to ten minutes, accompanied by straining and some pain.

When I examined this patient before operation I found a spastic condition of the limbs. At times he was seized with severe pain in the legs, and cried out so much as to disturb the others. He had also abdominal pain with flatulence, and lay mostly on his side with the knees drawn up.

Operation (August 27th, 1916).—From the position of the bullet as shown by the X ray it might have been deeply buried in the bone. The symptoms pointed to a severe injury to the cord with progressive destruction, and not to a complete lesion. An incision was made in the median line and the muscles detached from the left side only. The bullet was found lying between the laminæ of the eleventh and twelfth dorsal vertebræ. The eleventh lamina was broken, several fragments being driven into the canal. The spinous process and the right lamina, not being broken, were left. The opening into the canal was enlarged sufficiently to give a full examination and ascertain the absence of further fragments or of projecting bone. The dura was uninjured and was not opened. The muscles were sutured, the wound closed, and a primary union resulted. No immediate or striking result was observed after the operation, and only gradually did he obtain control over the bladder and rectum.

Three months after operation (Nov. 30th) his condition is as follows: He can retain urine for three hours, and longer during the night, and can, when the need comes, wait a little time. He has control over the rectum, but owing to the approximation of the thighs and tenderness in the back he cannot use a bed-pan, nor is he able to sit up on a commode. He has pain in both legs and below the ribs on both sides as well as in the abdomen. He is free from pain for several days at a stretch, and then may require a sedative for two or three nights. He can feel cotton-wool and pin-prick over the whole of the right lower limb, but not in the left thigh, while he can feel below the knee. He can move the toes and slightly the ankles on both sides, and he has some voluntary movement in the muscles of the thighs. For the most part, however, both lower limbs are in a spastic condition, the knees held tightly against one another.

It is impossible to say how far the recovery of voluntary power over the bladder and rectum has been due to the operation and not simply to the healing influence of time. The absence of any immediate effect and the very slow improvement suggest that the damage to the cord was due to the crushing effect and to the concussion and not to continued pressure. On the other hand, it must be remembered that the bullet with depressed fragments had lain on the cord for 25 days, and that already a spastic condition had set in, with pain which at times was most severe.

CASE 6. *Removal of shell fragment from within the theca spinalis.*—Sergeant ——, aged 32, was wounded outside Trones Wood on July 31st, 1916. He was admitted to Netley on August 13th under the care of Captain G. F. Holt, to whom I am indebted for the notes. The patient had multiple wounds of the back, with flaccid paralysis of both legs. A week later, when I saw him, there was some power in the sartorius and adductors of the left thigh. The anæsthesia was irregular; the knee-jerks were absent. He had sensation of pins and needles in both feet and at times the legs jumped, especially when the bladder was full, and with these movements he had fresh pain. There were retention of urine and incontinence of fæces. The X rays showed a metal fragment directly in the shadow of the centre of the twelfth dorsal, with indefinite injury to the appendages of this vertebra. (Fig. 3.) The entrance wound was to the left of the spinous process of the same vertebra.

Operation (August 26th, twenty-sixth day; wound healed).—As the missile had entered from the left the muscles were detached from this side only. A large collection of pus was encountered and the track led at once to the injured lamina. After removal of loose pieces of bone and some portions of the still firm lamina, an opening in the dura was found through which the cord could be seen. On separating the nerve trunks the piece of metal was removed from the front of the cord. No cerebro-spinal fluid escaped at this time or afterwards. The wound was lightly packed with gauze and granulated up. At no time was there any sign of meningitis.

Three months after operation this man is still in bed, the incontinence of urine remains, sensation has not increased in area, though it is more acute. The power in the adductors and sartorius muscles of the left thigh has increased, but there is no gain of power in the right lower limb. He has pain, at times severe, in both big toes, extending to the instep, but nothing to that existing before operation. There is no bed-sore.

No marked result can be directly traced to the removal of the foreign body, the general all-round improvement being such as one sees where a foreign body is not lodged. There can, however, be no doubt that his prospects of improvement have been increased by the operation.

As an example of the removal of a rifle bullet by a full laminectomy from amongst the nerve trunks of the cauda equina, the following case may be related:—

CASE 7.—Corporal —— was hit on Sept. 17th, 1916, and was admitted into Netley on the 27th under the care of Lieutenant S. G. Scott, to whom I am indebted for the notes. There was an entrance wound in the back six inches to the left of the median line opposite the level of the third lumbar vertebra, but no exit wound. The X rays showed a rifle bullet, base upwards, lying in the median line, the shadow being on the body of the first lumbar and partly over the disc below. Both legs were flaccid; sensation was retained in the right thigh, and he said he could feel the wound in the right calf. The left lower limb was completely anæsthetic. There was pain in both feet, particularly in the great toes. The only motor power was a just perceptible movement in the great toe of the right foot. There was severe cystitis with hæmaturia, and the man was ill and somewhat wasted. The symptoms indicated a lesion of the cauda equina, and operation was decided upon at once, it being arranged to control the urine through a suprapubic opening.

Operation (Oct. 1st).—The laminæ and spinous processes of the first and second lumbar vertebræ were removed. The theca was found uninjured, and looked broadened opposite the first lumbar. The space between the theca and bony wall was searched in front of the cord, and the bullet not being found the theca was incised. On opening the dura a small elongated clot was found extending downwards. This was followed by removing the laminæ of the third lumbar. Here the cauda equina was found much torn and bruised. On separating the nerve-trunks over the first lumbar the bullet was found lying in front of these structures with its base upwards. At this point the nerve-trunks were discoloured and torn. I was unable to trace the path of the bullet, but inferred that it had entered through the intervertebral foramen between the third and fourth lumbar, turned upon itself, and passed upward to the position where it was found. The theca and muscles were sutured with catgut, the wound closed by Michel's clips without drainage, and covered with a collodion dressing, primary union resulting.

The man improved rapidly in general health; the urine cleared far more quickly than with intermittent catheterism. The pain in the feet disappeared at once, and is now only felt occasionally in the left heel. At the present time, just under six weeks from the operation, he has gained power in the hamstrings and calf muscles, but there is no return in the extensor groups. Sensation has returned to a great extent in both lower limbs.

The rapid general improvement in this man must, I think, be set down primarily to the removal of the urinary sepsis. And this has promoted the recovery of the lesion in the cord. There is still incontinence of fæces. The bladder being still drained one cannot speak of the muscular power.

The possibility of an unnecessary search being made for a bullet lying in a harmless position is illustrated by the next case, for the notes of which I am indebted to Captain D. F. Shearer. The septic infection of the urinary tract, however, rendered any operation out of the question. The specimen shows that though the bullet may reach a position where it is in itself innocuous, the broken and displaced

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Three months after operation (Nov. 30th) his condition is as follows: He can retain urine for three hours, and longer during the night, and can, when the need comes, wait a little time. He has control over the rectum, but owing to the approximation of the thighs and tenderness in the back he cannot use a bed-pan, nor is he able to sit up on a commode. He has pain in both legs and below the ribs on both sides as well as in the abdomen. He is free from pain for several days at a stretch, and then may require a sedative for two or three nights. He can feel cotton-wool and pin-prick over the whole of the right lower limb, but not in the left thigh, while he can feel below the knee. He can move the toes and slightly the ankles on both sides, and he has some voluntary movement in the muscles of the thighs. For the most part, however, both lower limbs are in a spastic condition, the knees held tightly against one another.

It is impossible to say how far the recovery of voluntary power over the bladder and rectum has been due to the operation and not simply to the healing influence of time. The absence of any immediate effect and the very slow improvement suggest that the damage to the cord was due to the crushing effect and to the concussion and not to continued pressure. On the other hand, it must be remembered that the bullet with depressed fragments had lain on the cord for 25 days, and that already a spastic condition had set in, with pain which at times was most severe.

CASE 6. *Removal of shell fragment from within the theca spinalis.*—Sergeant ——, aged 32, was wounded outside Trones Wood on July 31st, 1916. He was admitted to Netley on August 13th under the care of Captain G. F. Holt, to whom I am indebted for the notes. The patient had multiple wounds of the back, with flaccid paralysis of both legs. A week later, when I saw him, there was some power in the sartorius and adductors of the left thigh. The anæsthesia was irregular; the knee-jerks were absent. He had sensation of pins and needles in both feet and at times the legs jumped, especially when the bladder was full, and with these movements he had fresh pain. There were retention of urine and incontinence of fæces. The X rays showed a metal fragment directly in the shadow of the centre of the twelfth dorsal, with indefinite injury to the appendages of this vertebra. (Fig. 3.) The entrance wound was to the left of the spinous process of the same vertebra.

Operation (August 26th, twenty-sixth day; wound healed).—As the missile had entered from the left the muscles were detached from this side only. A large collection of pus was encountered and the track led at once to the injured lamina. After removal of loose pieces of bone and some portions of the still firm lamina, an opening in the dura was found through which the cord could be seen. On separating the nerve trunks the piece of metal was removed from the front of the cord. No cerebro-spinal fluid escaped at this time or afterwards. The wound was lightly packed with gauze and granulated up. At no time was there any sign of meningitis.

Three months after operation this man is still in bed, the incontinence of urine remains, sensation has not increased in area, though it is more acute. The power in the adductors and sartorius muscles of the left thigh has increased, but there is no gain of power in the right lower limb. He has pain, at times severe, in both big toes, extending to the instep, but nothing to that existing before operation. There is no bed-sore.

No marked result can be directly traced to the removal of the foreign body, the general all-round improvement being such as one sees where a foreign body is not lodged. There can, however, be no doubt that his prospects of improvement have been increased by the operation.

As an example of the removal of a rifle bullet by a full laminectomy from amongst the nerve trunks of the cauda equina, the following case may be related:—

CASE 7.—Corporal —— was hit on Sept. 17th, 1916, and was admitted into Netley on the 27th under the care of Lieutenant S. G. Scott, to whom I am indebted for the notes. There was an entrance wound in the back six inches to the left of the median line opposite the level of the third lumbar vertebra, but no exit wound. The X rays showed a rifle bullet, base upwards, lying in the median line, the shadow being on the body of the first lumbar and partly over the disc below. Both legs were flaccid; sensation was retained in the right thigh, and he said he could feel the wound in the right calf. The left lower limb was completely anæsthetic. There was pain in both feet, particularly in the great toes. The only motor power was a just perceptible movement in the great toe of the right foot. There was severe cystitis with hæmaturia, and the man was ill and somewhat wasted. The symptoms indicated a lesion of the cauda equina, and operation was decided upon at once, it being arranged to control the urine through a suprapubic opening.

Operation (Oct. 1st).—The laminæ and spinous processes of the first and second lumbar vertebræ were removed. The theca was found uninjured, and looked broadened opposite the first lumbar. The space between the theca and bony wall was searched in front of the cord, and the bullet not being found the theca was incised. On opening the dura a small elongated clot was found extending downwards. This was followed by removing the laminæ of the third lumbar. Here the cauda equina was found much torn and bruised. On separating the nerve-trunks over the first lumbar the bullet was found lying in front of these structures with its base upwards. At this point the nerve-trunks were discoloured and torn. I was unable to trace the path of the bullet, but inferred that it had entered through the intervertebral foramen between the third and fourth lumbar, turned upon itself, and passed upward to the position where it was found. The theca and muscles were sutured with catgut, the wound closed by Michel's clips without drainage, and covered with a collodion dressing, primary union resulting.

The man improved rapidly in general health; the urine cleared far more quickly than with intermittent catheterism. The pain in the feet disappeared at once, and is now only felt occasionally in the left heel. At the present time, just under six weeks from the operation, he has gained power in the hamstrings and calf muscles, but there is no return in the extensor groups. Sensation has returned to a great extent in both lower limbs.

The rapid general improvement in this man must, I think, be set down primarily to the removal of the urinary sepsis. And this has promoted the recovery of the lesion in the cord. There is still incontinence of fæces. The bladder being still drained one cannot speak of the muscular power.

The possibility of an unnecessary search being made for a bullet lying in a harmless position is illustrated by the next case, for the notes of which I am indebted to Captain D. F. Shearer. The septic infection of the urinary tract, however, rendered any operation out of the question. The specimen shows that though the bullet may reach a position where it is in itself innocuous, the broken and displaced

bone may be doing harm. And here it must be noted that the X rays do not always show these depressed fragments. It may be said on the X ray findings that the bullet having injured the cord on its passage to a harmless position, and having done its work, operation will do no good. On the other hand, a fragment of bone may have been driven into the cord and be responsible for part of the symptoms, and, remaining, prove a continual source of local irritation and of pain, this more especially when the entrance wound is behind or to one side of the spine.

CASE 8.—Private —— was hit by a shrapnel bullet which entered 1½ inches to the left of the twelfth dorsal spinous process and was seen by the X rays to lie in the centre of the body of the eleventh dorsal vertebra. (Fig. 4.) No injury to the lamina was apparent. He was hit on Sept. 15th and admitted to Netley on the 29th with flaccid paralysis of both limbs. There was sensation down the front of the right thigh, shooting pains in the legs, and a feeling as of electric shocks in the left foot. The cystitis was severe, the sacral bed-sore moderate in size. There never was a moment when operation could be considered, for notwithstanding daily attention to the bladder, pus continued to escape, indicating infection of the ureters and kidneys; the temperature remained high, reaching sometimes 103° F. The wasting was extreme. The bed-sore improved under the careful attention of the nurses. He died just under nine weeks from the injury.

At the autopsy we found that the bullet had entered between the laminæ of the twelfth dorsal and first lumbar on the left side. The upper border of the lower arch was roughened but not broken, so that from an external examination it did not appear that any fragment had been driven into the cord. On dividing the bodies from the arches (Fig. 5) the bullet was found almost completely buried in the body of the eleventh dorsal a little to the right of the median line. The exposed part was so small that it could not have exerted any pressure on the cord. The bullet in its course had broken off and driven in a fragment of bone, which was closely adherent to the trunks going to form the cauda equina. Just above this point the cord was softened and semi-fluid in its left half. Many of the trunks on the right side were apparently uninjured. The bladder was black from old blood effusion, but clean, the ureters much dilated and filled with pus, the pelves of the kidneys in the same condition, and there were suppurating foci in the cortex.

Had the general condition permitted it an operation in this case would have done some good by removing the fragment of bone, the lesion being incomplete. The specimen and the drawing show the formation of cicatricial tissue round the fragment, the cause of the pain from which the man suffered. The damage to the cord was extensive and, of course, irrecoverable, yet one may take it that had it not been for the infection of the urinary tract this man would have lived indefinitely, and some benefit at least would have resulted from removal of the indriven bone. The bullet could have been reached without difficulty by displacing the cord. Would its removal have been necessary? The question is worth asking, for similar cases will no doubt occur. Personally I do not think it is necessary to extract a bullet in this position. Exerting no compression, the only sound reason would be the danger of meningitis from infection. This had not occurred after nine weeks, and should not arise as a result of the operation, provided no attempt were made to remove it.

INJURIES TO THE CAUDA EQUINA.

The spinal cord terminates, I may remind you, at the lower border of the first lumbar vertebra, the lumbar and sacral nerve roots occupying the rest of the canal. These, each composed of two trunks, the one motor the other sensory, pass to their respective foramina, where the bundles unite to form the composite nerve. The separation of the two parts of the nerve trunks explains many of the irregular paralytic and anæsthetic results of injury.

Gunshot wounds may pick out particular nerve trunks, and it is possible to ascertain with exactness which have suffered. The level of origin of each being known, it is also possible to reach the injured trunk after opening the theca. Unlike the cord, these intraspinal nerve trunks correspond in structure with peripheral nerves and possess a corresponding capacity for spontaneous recovery from bruising and partial laceration. If sutured they may be expected to unite with restoration of conductivity.

The diagnosis of these lesions does not present any difficulty when confined to the nerve trunks. In estimating, however, the prognosis, it is important and more difficult to ascertain if there be any injury to the conus. Fortunately, recovery of power over the bladder and rectum usually occurs after a time. Pain in the legs and feet may be severe and last several months.

In a young soldier (Case 3) of 19, hit on July 1st, the pain in both legs was severe; it disappeared from the right after removal of fragments of bone and metal 41 days after the injury, but was still felt at times in the left after the lapse of six months, and was then severe enough to require morphia occasionally at night. Bladder control returned in six days after the injury in this case. He remains in his seventh month completely paralysed below the knees. The wound in this man was on admission large and septic and situated over the second and third lumbar vertebræ. For the notes of this case I am indebted to Captain Henderson.

In an earlier part of this lecture I have stated my own belief that early operation should be undertaken where foreign bodies are lodged in the arch of the vertebra or where a penetrating missile has broken the laminæ. The reasons apply with greater force where pressure and irritation must, if existing, interfere with the recovery of injured nerve trunks. On the other hand, seeing the amount of spontaneous recovery that takes place in bruised or torn peripheral nerves, it is urged by many that a period of some months should elapse before any operation is undertaken on the cauda equina. So far as operation is limited to the removal of indriven fragments and foreign bodies without opening of the theca I see no reason for delay, provided an aseptic operation can be performed.

The important question arising in this part of the cord is that of suture of the nerve trunks, for in this direction lies the future of the surgery of the cauda equina. Tuffier's successful case has shown the possibility of accomplishing this result. Should suture be attempted as early as possible, and at the same time as an operation for removal of bone fragments? Or is it better to make two operations, and, if so, is the second rendered more difficult by reason of the first? Again, should all operations be postponed for some months in these cases to see how far spontaneous recovery is possible, say for six months?

Past experience will lend support to delay, and so will the result of injuries to peripheral nerves. On the other hand if full consideration be given to the findings recorded in late operations, and to the condition found at the autopsy in Case 8, the advantage from early operation becomes obvious. Here it must be remarked that sufficient time must be allowed to elapse for the exclusion of simple concussion. The wound also may take from one to three weeks to heal, so that there will always be a fair period for observation.

One's experience at present does not provide an answer to the question as to whether an operation for removal of fragments renders one for subsequent suture more difficult. Looking, however, to the amount of new bone formed in a case to be mentioned presently, one would surmise that the opening of the theca would be less difficult, for the earlier removal of fragments would diminish the osseous formation.

While recognising the magnitude of the operation, the difficulties of working in so confined a space, of finding and suturing the divided ends, and the danger of inflicting further injury, I believe it will be wiser to undertake operation as soon as all things are favourable. Unfortunately, in most of these cases arriving in England urinary infection and bedsores render operation impossible for many weeks. The prevention of urinary infection becomes a most important matter, and I hope, if time permit, to indicate a method by which this destructive complication may be met.

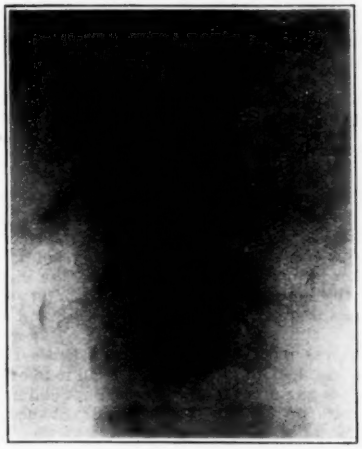
Cauda equina injuries have been comparatively common. I have notes of seven cases admitted into one hospital within six months. Though they all vary a good deal as to symptoms, there was no difficulty in recognising the lesion, and recovery was satisfactory up to a certain point. The following case is an example.

CASE 9.—In this case, under the care of Captain E. G. Smeed, there was complete flaccid paralysis, retention of urine, with incontinence of fæces. For many weeks the man's life was despaired of from urinary infection, septicæmia, and bedsores. He had double acute parotiditis and right panophthalmos. At the end of 1½ years he is able to get about in a wheeled chair, and his general condition is excellent. There is complete paralysis of all muscles below the knees, those of the thigh being good. He can retain urine for three hours, while the rectal control is uncertain.

FIG. 2.

CASE 5.—Shrapnel bullet, with fracture of the left lamina of the eleventh dorsal vertebra.

FIG. 3.

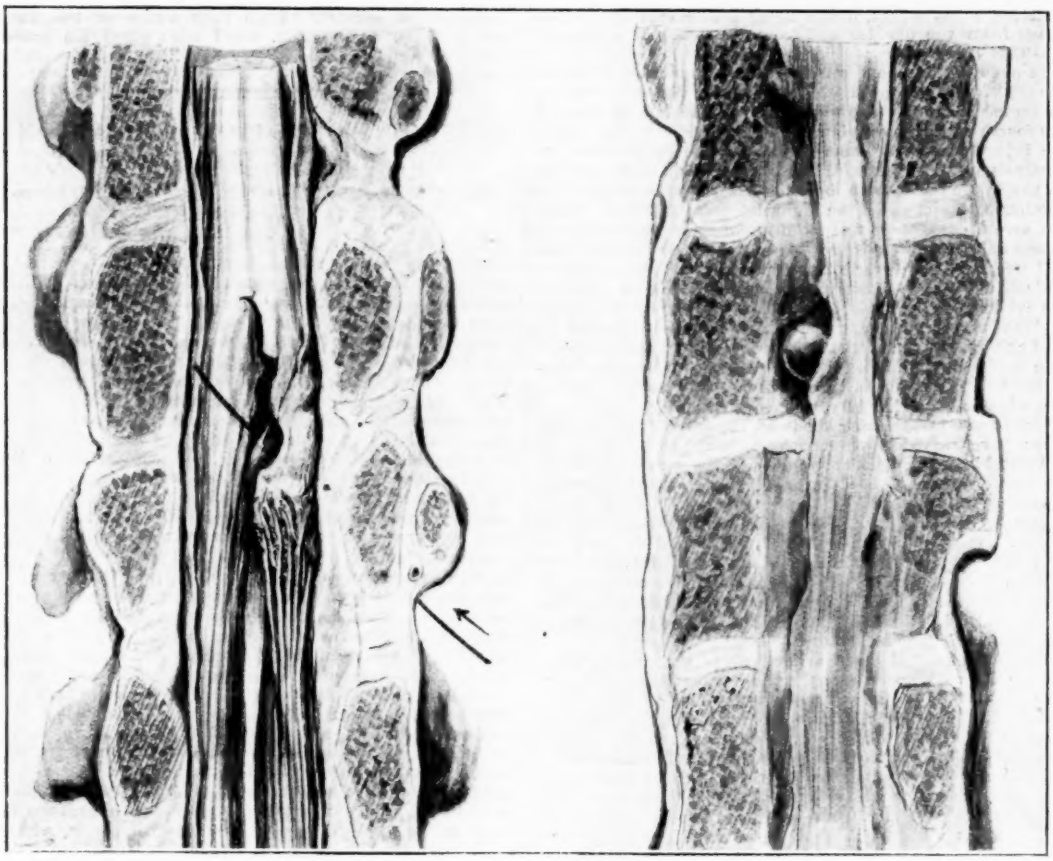


CASE 6.—Shell fragment amongst the trunks of the cauda equina; level of twelfth dorsal vertebra.

FIG. 4.

CASE 8.—X ray showing position of shrapnel bullet.

FIG. 5.



CASE 8.—The bullet embedded in the posterior wall of the eleventh dorsal vertebra is made in the drawing to project too far. The irregular mass to which the nerve trunks are attached is the piece of indriven bone. The course of the bullet and the laceration of the cord are also shown.

The bullet entered the ilium 1½ inches below the crest and passed through the fifth and fourth lumbar vertebræ. A sinus existed for more than a year, discharging small crumbs of bone from time to time. There is a marked enlargement from new bone formation about the fourth and fifth lumbar vertebræ.

While I have no doubt that, had the patient's condition permitted, an operation would have been wise soon after the injury, I have not sufficient experience to decide whether, after an interval of 18 months, an attempt to restore the continuity of the sacral nerves would be successful.

INJURIES TO THE CERVICAL SPINE.

My notes of ten recent cases, some from the Royal Victoria Hospital, others from the Welsh Hospital (the latter through the kindness of Lieutenant-Colonel Cook and his staff), together with several observed in Malta, show the remarkable tendency to recovery in those cervical injuries which reach our hospitals. In the higher lesions and those which are complete about the level of the fourth and fifth cervical vertebræ the patients either are killed outright or die early.

In one case a flat fragment of copper was embedded in the transverse process of the fourth cervical and was removed. There was considerable injury to the process and to that of the fifth, together with fracture of the bodies. Captain W. M. Howells, who made the X ray examination, thought there was probably a fracture dislocation.

CASE 10.—This young soldier (Private ——) was wounded on Sept. 9th and lay in the open two days. He was admitted to Netley under Captain Newman Smith on the 17th with a septic wound in the neck behind the right sterno-mastoid; no exit wound. There was complete paralysis of the right arm and leg with loss of sensation, partial loss of power of the left arm and leg with loss of sensation, retention of urine, and incontinence of fæces. The wound was opened up, drained, and the metal fragment removed. He survived three weeks, death being accelerated by hæmorrhage from the bladder and from the track of a perineal drainage operation.

In none of the others was there any impaction of metal, though fragments were to be seen in the soft tissues. In three the X rays showed injury to the lateral mass of the fourth and fifth vertebræ or fifth only. In four others the injury was in the same region. All these patients had paralysis of varying extent. In one the right arm and leg on the injured side, with loss of sensation on both sides; in another both arms and the right leg were affected. In all the severe cases there was retention of urine for a few days, in one only there was severe hæmorrhage and cystitis. Time will not permit the record of the symptoms more than to indicate that the lesions were severe, as shown in eight by the evidence of paralysis, &c., and in several by the X ray evidence of bone injury. One patient, the first referred to, died chiefly from hæmorrhage from the bladder and the track of a perineal puncture. The cystitis, always severe, contributed to the fatal result. All the others have improved, the slighter cases rapidly, the severe slowly. The most severe is now just walking about at the end of four months, others have walked in two months.

A notable feature about wounds of the cervical spine is the small degree of cord injury when compared with that occurring in the dorsal and lumbar regions with a similar degree of bone injury. The transverse processes will be broken, a fragment of shell lodged and buried in the arch, even the body of the vertebra broken, and yet the nerve injuries be recoverable. The mobility and flexibility of this section of the spinal column, and in consequence the diminished resistance offered to the projectile, probably explains the difference.

The conclusion I have arrived at is that these cases recover so well spontaneously that unless there is pain from pressure on the nerve trunks it is wiser to leave them alone. In this view I may be wrong; it may be a sounder practice to remove loose fragments early, and a more extended experience may lead one to change this opinion.

Those who favour operation in cervical cases must admit that spontaneous recovery in many cases is so rapid and complete that too much may easily be attributed to operation. In such a case as that report by Major Hull[1] the recovery was unusually rapid, a definite improvement in sensation being observed the next day; and the patient had recovered the use of his paralysed leg within three weeks. A depressed fragment of bone lying upon the theca was removed. It may certainly be admitted that the rapid healing of the wounds, the slight amount of shock, and the comparatively short duration of the operation justify more frequent resort to interference.

[1] Brit. Med. Jour., April 22nd, 1916.

CONCLUSION.

With regard to the details of the operation of laminectomy I have nothing particular to say. They will be found most conveniently in Major Hull's "Surgery in War," where will also be read the best summary of recent progress. This should be amplified by reading the paper just referred to by the same author. I may add, however, that, unlike Major Hull's, my operations have been done under ether without any anxieties, but then we have had the advantage of a particularly skilled anæsthetist in Captain J. S. Steele-Perkins. One other point is worth referring to. Removal of the first lamina is the only difficulty, and can be met by applying an inch trephine after removal of the spinous processes. Trepanning the spine is, after all, the name used by Larrey and the older writers. I am indebted to Major Soutar, of the Red Cross Hospital at Netley, for this suggestion, and commend it to others.

I cannot claim, Mr. President, to have brought before you any brilliant successes or any new method. Rather is the attempt to deal with these distressing cases disappointing. I hope, however, in summarising a somewhat limited experience I may have indicated the comparative safety of laminectomy carried out under the best conditions, and emphasised the necessity of dealing promptly with septic compound fractures of the spine on ordinary lines, avoiding unnecessary incisions, removal of uninjured bone or opening the uninjured theca. The observations I have brought before you of the comparatively slight risk of meningitis in septic wounds when treated by the open method may, I hope, be of service. I am fully aware of the hurried nature of the composition, but I must plead the exacting nature of duties that have left but little time for study or investigation.

GUNSHOT WOUNDS OF THE ABDOMEN DURING THE SIEGE OF KUT.

BY C. H. BARBER, M.R.C.S. ENG., L.R.C.P. LOND.,
MAJOR, I.M.S.

SINCE my recent return from Bagdad I have had an opportunity of reading the several excellent papers published on the subject of penetrating wounds of the abdomen, notably those by Fraser and Bates in April last, and by Webb and Milligan in October. It is therefore now with some diffidence that I venture to add another to the number already written. But it seems to me that the advisability of operation on principle as the only reasonable treatment in these cases is still perhaps not sufficiently realised. Moreover, my own cases, practically all occurring during the siege of Kut from the beginning of December, 1915, to the end of April, 1916, were treated under exceptional and adverse circumstances. For instance, the wounds themselves were usually inflicted by a slower and larger bullet (about ·400 inch) than that met with in Europe, so that the damage to the gut itself was presumably rather more severe than that caused by the smaller high-velocity missile. The health of the men in Kut grew progressively worse as the siege wore on, until towards the end one often hesitated to operate, and the prognosis after operation was seriously affected by the debility of the victims. The hospital buildings consisted of the shops or cubicles of a covered Arabian bazaar, each big enough for about four patients on the ground or two on beds, though beds were scarce. Besides these we occupied a large number of Arab houses, some of which had two storeys, but most of them were mud-brick dwellings comparable to Indian servants' quarters and very difficult to keep clean. Our fine new wooden hospital, with its large airy wards, which we had built just before the siege began, was almost the first thing to get in the way of the Turkish shells, and we had regretfully to abandon it in the first week, but it was almost a case of out of the frying-pan into the fire. The operating-room was also a mud-walled dungeon, with a large hole in the roof to admit light; in wet weather this

also admitted rain. To give proper nursing and suitable after-treatment was not easy, and the fact that the hospital was generally under shell- or bomb-fire once or twice a day did not add to the comfort or mental repose of its inmates. Such recoveries, therefore, as occurred after operation—and there were practically none apart from it—may be looked upon as the minimum number possible under this method of treatment; but to my mind they are sufficient to indicate the value of operation, and indeed to show that wounds of the abdomen involving the intestines should always be so treated. A further point of interest lies in the fact that owing to the small size of Kut and the proximity of the hospital to the trenches many of my cases were obtained within a few minutes to an hour of their being hit, so that they include a class of case which as a rule never reaches a hospital at all but dies on or near the field. Several of the cases were amongst soldiers or civilians who were hit in the town or on the river bank, close to the hospital, by snipers.

After South Africa the general impression left on surgeons' minds was that penetrating wounds of the abdomen involving the peritoneal cavity and its contents were best left alone, and indeed one excellent text-book went so far as to say that by this method 40 per cent. of cases recovered. But these figures, it is probable, are based on official records from admission- and discharge-books, in which gunshot wounds of the abdomen include all wounds, flesh or otherwise, in the abdominal region, and are useless for purposes of comparison. Makins saw no case recover in South Africa in which the small intestine was injured. Such operations as were performed were usually unsuccessful.

Laurent, from his experiences in the Balkan wars, preserved rather an open mind on the subject of the treatment of these wounds, but went so far as to advocate laparotomy when this could be done early, especially in the first six to eight hours, and certain Bulgarian reports seemed to confirm this. They stated that one advantage of early operation is that it may save some who would otherwise die of hæmorrhage—a very important point. Lucas-Championnière, Reclus, Bozzi, and others advised conservatism unless operation could be performed early in a modern hospital. Kahn, writing in 1913, from experience in civil practice, says: "In every case of penetration of the abdomen by a bullet, multiple perforations of the viscera are to be assumed and prompt surgical exploration is demanded."

La Garde says: "It would seem to have been proved that the abdomen may be traversed by a missile without perforating hollow viscera, but perforation is the rule," and also that some cases recover spontaneously in spite of perforation. He quotes the case of Major Thornton, of the United States Army, who had 18 wounds of the intestine, but no complete perforation. He submits that the natural redundancy of the mucous coat, which fills the wound like a hernia, may prevent the escape of gas and fæcal contents. He, however, comes to the conclusion that exploratory operation should be performed when environment permits.

In the early days in France nearly all these cases died, whether operated on or not. They were usually not received for many hours. Up to early in 1915, 85 per cent. of cases died by the time they reached England (Wallace). Schnieden states that spontaneous recovery is exceedingly rare, whilst recovery after operation was 27 per cent.

Up to the summer of 1915 the majority of the German surgeons at Lille advocated conservative treatment, but opinion was then changing. Demmer, writing in 1915, also advocated conservatism and gave a death-rate of only 24 per cent., but fuller particulars of these cases would be required before accepting them as perforating wounds. Friedrich gives interesting figures. 85 per cent. of cases treated without operation died within two days. Of those that reached the home hospitals (i.e., after two days), 38 per cent. died. Under conservative treatment the prognosis improved the higher up in the abdomen the wounds were inflicted, the best being in stomach and liver cases. Enderlen gives 30 per cent. recoveries after operation. Early in the present war he had operated as late as 18 to 24 hours after the wound occurred, but invariably found purulent peritonitis without adhesion of the abdominal organs or any sign of a mucous plug in the perforations. Prolapse cases ended fatally. Sauerbach endorsed the policy of operation in abdominal wounds and claimed 42·5 per cent. Korte states that the length of time that elapses before operation is the important factor; after 12 hours the prognosis is bad, especially if the case has been transported over rough roads.

Morley, after his experience in Gallipoli, writes: "It can generally be assumed where the wound of exit like that of entrance is the typical small puncture of the modern rifle bullet that the bullet will have drilled through the intervening viscera, causing holes no greater than in the skin, and that the redundant mucosa of the stomach or intestine will plug up the holes and prevent the escape of the contents, until plastic adhesions have completed the healing process." This to me is an astonishing statement, as all my experience went to show that the nature of the wounds gave little or no indication of the amount of the damage internally. Morley therefore adopted a routine treatment of morphia, Fowler position, and giving nothing by the mouth for 24 hours, with saline when necessary subcutaneously. Operation was undertaken if sufficiently obvious. In wounds inflicted by shell or shrapnel he advocates operation.

Mayo Robson, at the end of 1915, wrote that a clean bullet wound through the abdomen with small wounds of entry and exit and without evidence of internal hæmorrhage or extravasation may, if favourably situated, be treated expectantly. But the trouble is that internal hæmorrhage and extravasation may give no evidence until too late. He thought operation well worthy of consideration if early and the patient fit and in suitable surroundings.

Fraser and Bates, in their illuminating and conclusive paper, come to the conclusion that in the vast majority of cases of penetrating wounds of the abdomen operative measures offer the best chance of success, but qualify their statement by excluding from that category uncomplicated wounds of the liver and certain wounds of the kidney. My own experience is in almost entire agreement with theirs, and their interesting drawings depict conditions of the gut that were met with in very many of my cases.

Webb and Milligan would operate on most cases, but not at once on principle. They do not operate where there is doubt as to penetration, when the liver or the kidney alone is involved or when the case is moribund. They give a full account of their methods of examination and of the clinical signs one meets with in these cases. With them Crisp English is in agreement, but excepts also a diaphragmatic group with extensive injury to the lower chest and upper abdomen. He often postponed operation in shock and hæmorrhage cases. He states that spontaneous recovery is a very rare event and that wounds of the central and lower abdomen are fatal if left alone.

My own experience of some 90 cases, together with particulars supplied by my colleagues of a dozen more, has led me to conclusions which agree in the main with those expressed in the last three papers. In 10 months of the early part of the war, between November, 1914, and October, 1915, only 10 cases of penetrating abdominal wounds among the Indian troops arrived at the base hospital at Busra, to which all cases came—that is to say, the other cases died within a day or two. Of these 10, nine died, whilst the tenth was transferred to India, and I am ignorant of his fate. It was a case with an entrance wound only, and it is quite likely that he would require an operation later for fæcal fistula. None of these cases was received within 20 hours of injury, and some of them had been wounded for a much longer time; none was operated on. Similarly, of the 44 Kut cases that were not operated on, 41 died, and of the three that survived two were "liver only" cases. The third (Case 22) was a lower abdomen case, and the only one I have seen recover without operation. These figures are sufficient to emphasise the appalling mortality of abdominal wounds in the lower part of the belly and the urgent need for active treatment. By "lower part" I mean any portion below the transpyloric plane, which serves as a rough guide. "Operation on principle" refers to this part. It had always seemed to me that these cases should be treated as acute abdominals, and that operation held out the only reasonable hope of recovery, provided that they could reach a stationary hospital before serious peritonitis set in. The investment of Kut provided an unusually good opportunity of getting these cases within a very short time after they were wounded. Colonel Patrick Hehir, C.B., was good enough to arrange that all abdominal cases should be sent at once to the General Hospital whenever this was possible, with the result that many of them were admitted within from 15 to 60 minutes. Thirty were admitted within an hour of injury.

Many of these, of course, were cases such as ordinarily die on the field of battle and do not reach a hospital at all, but one or two were saved who would otherwise have died from hæmorrhage or who would have been beyond hope of operation by reason of hæmorrhage had they been admitted later. Herein lies the importance of immediate operation unless one can be reasonably sure that serious hæmorrhage is not taking place. By serious hæmorrhage is meant bleeding rapid enough either to be fatal within a few minutes or so to reduce the strength of the patient in an hour or two as to contra-indicate operation. If one can be reasonably sure, then it is obvious that anti-shock measures and time given to the patient to recover from the shock of his injury are of paramount importance, since leaving him for five or six hours does not, I think, add seriously to the risk of severe peritonitis. But I have found it sometimes extremely difficult to be sure just when to leave patients, for the changes in the pulse may not be at all alarming, and may fall very far short of what one is accustomed to appreciate as a bleeding pulse long after the bleeding has gone on to a dangerous extent, when the effect of the operation is added thereto. Unfortunately, a large number of these cases do bleed, and there seems to be little or no tendency for the hæmorrhage from ruptured vessels in gut or mesentery to stop. Several times I have been astonished on opening an abdomen to find a large quantity of blood in the peritoneal cavity such as one would have thought would have had a very definite effect on the pulse, whereas a very few beats above the normal has been all the evidence obtainable. Moreover, I am inclined to think that the shock of opening the abdomen and consequent exposure of the intestines to the air, whether Yandell Henderson's CO_2 theory be correct or not, is considerably accentuated after even moderate bleeding, and this has to be taken into account before deciding to wait.

As regards the question of operating on these abdominal cases or indulging in expectant treatment, I would operate on all cases of penetrating wounds below the transpyloric plane as a routine method, provided, of course, that the patient be considered fit enough to stand the operation. The length of time that may be allowed to elapse before operation will vary with the condition of the patient and the existence or probability of hæmorrhage. If there is bleeding operation must be undertaken at once; if not, it is permissible to wait up to 8 or 9 hours. It is doubtful if, as a rule, operation is worth while after 12 or 14 hours have elapsed. Of 9 cases operated on after 12 hours or more, only 1 recovered. Of the 98 cases I am able to quote 42 were operated on, with 10 recoveries. 90 of the cases were wounds below the transpyloric plane, and of these 40 were operated with 9 successes. Of the other 50 one lived, one was awaiting operation just before the end of the siege, and the fate of the third is doubtful. These successes represent the minimum number possible. Under better conditions more would have lived. I have no doubt also that operating on several of the bleeding cases was of the nature of a forlorn hope, and I now feel that some of the others might have been all the better for more prolonged anti-shock treatment, but this was difficult to give. Of wounds above the pyloric plane 2 were operated on with one recovery, and of the 6 unoperated on 3 lived. Of these 2 were "liver only" cases, and in the third the bullet just skimmed the under surface of the same organ (Case 88).

The cause of death in the majority of cases was a combination of hæmorrhage and shock; many died from the former alone. Those that survived the first two days died from peritonitis. Three died from this cause after operation. No case developed gas gangrene or spreading cellulitis. The amount of damage done to the intestine is practically always serious and varies greatly from one or two holes or rents to a dozen or more.

Clinical signs and symptoms are not a reliable guide to the extent of the lesions (*vide* Cases 7, 60, 15, 18, 20, 24, 25, 30, 35, 41, 42). Usually there are several holes or rents of all sizes from a threepenny-bit to a longitudinal rent several inches in length. I have only once seen a very small hole that might presumably have been occluded by natural means, and then it was not the only one; the average hole was about ¼ to 1 inch in diameter, with thick pouting everted lips of contused mucous membrane. Fraser and Bates's pictures show the condition exactly. Sometimes the gut is almost completely severed as if it had been roughly cut; sometimes there are several holes or rents close together, and when this happens resection is the only remedy. The mesentery was nearly always holed or torn and smaller or larger vessels generally involved and bleeding; the severed walls of the gut always bleed steadily.

Extravasation of intestinal contents had always taken place in greater or less quantity, that from the large bowel having a strong odour. In one case a round worm, 8 inches long, was found free in the peritoneal cavity. In wounds above the pyloric line the liver, stomach, and spleen are the viscera affected. Wounds of the liver are not necessarily very serious; a clean drilled hole through the organ soon heals up, whilst a gaping rent of moderate size is easily stitched up; moreover, hæmorrhage from it tends to stop (Case 87). Wounds of the stomach are serious, and extravasation of its contents into the lesser sac is likely to occur as a complication, otherwise it is reasonable to suppose that small holes made in a single viscus whose walls are closely applied to solid structures might possibly become occluded naturally. The appearance of the external wound, unless very large, gives no information regarding the extent of the damage inside. Many of my cases had small external wounds co-existent with extensive lesions in the intestines.

As symptoms and signs, more or less pain is almost invariable, but I have seen one or two with practically none. I think it is less marked, as a rule, when there is much blood in the peritoneal cavity, bathing the torn tissues. Pain seems likely to be more severe with injuries low down in the pelvis. Vomiting is as often absent as present; rigidity and tenderness are almost always present; type of respiration varies with amount of rigidity. There is always more or less shock, but it, again, is not a reliable guide to the damage. The facies is, of course, a valuable indicator of shock and hæmorrhage, but the pulse is the most important of all—its rate, and especially any increase in rate after a short interval, are the most important indicators of hæmorrhage. Dullness in the flanks is seldom appreciable before the dangerous stage of hæmorrhage is reached, and so is of little value. Distension is not present in the very early stages, but comes on later. Hæmorrhage from the wound on meddling with it will sometimes give indication of the kind and extent of the bleeding. It is sometimes very difficult to decide whether penetration has occurred or not; the doubt should be cleared up by exploring the wound with the finger, first iodining the wound and enlarging it if necessary.

Little need be said on the subject of the operation. I used the most convenient incision in each case. Blood and contents obscuring the view are mopped up as quickly as possible. If the track of the bullet is accurately known examination of the whole length of the intestine is not always necessary and is inadvisable on account of shock. When the extent of the damage is known holes and rents are stitched up, by purse-string when very small, by through-and-through and Lembert when large; often, when hurried, I have used only one row of Lembert with no untoward result. After resection, end-to-end suture, but I have no doubt lateral anastomosis is better for the avoidance of post-operative gut paralysis. Resection appears to add considerably to the shock of operation. The peritoneal cavity is then cleaned and drained by a large ¾ inch rubber tube from the recto-vesical pouch to the lower end of the incision; possibly also by an extra tube locally. The Trendelenburg position was often found useful. Chloroform was the only anæsthetic.

As post-operative measures the head of the bed was raised; salines were given if necessary; water by the mouth after 12 hours, milk-and-water after 24. Good nursing was badly needed. Distension usually occurred, but generally disappeared by the third day; when it did not, turpentine stupes and small doses of mag. sulph. usually defeated it. Slight bronchitis often caused trouble.

The following are brief notes of the cases.

CASE 1.—Sepoy, Infantry; bullet. Admitted Dec. 14th, 1915, 8 hours after injury. Entrance wound in right flank just above iliac crest; no exit; hit just after taking food. Condition: Pain considerable. Abdomen rigid and tender. Pulse fair in quality and slow; shock moderate. No history of vomiting. Operation. Laparotomy 10 hours after injury. Incision parallel to fibres of external oblique. Large quantity of intestinal contents free in peritoneal cavity. There were two large holes in the small intestine near each other on opposite sides with everted edges. No chance of natural occlusion. These were closed by purse-string sutures. Bullet

not found. Result: Recovery. Had some griping pains after getting on to light diet.

CASE 2.—Driver, Mule Corps; bullet. Admitted Dec. 18th, 1915. Wounded same day. Entrance wound small; 2 inches above middle of left Poupart's ligament; no exit. Bullet palpable in left buttock near middle line, low down. Condition fair; pain moderate. Abdomen rigid and tender. No history of vomiting. Operation about 12 hours after injury. Incision 1 inch to left of middle line. The peritoneal cavity was full of bloody urine, with commencing peritonitis. There was one wound in the bladder, which was stitched up. No other intra-peritoneal wound. The peritoneal cavity was swabbed clean and drained at the lower angle of the wound from the recto-vesical pouch. Shock very considerable. Result: Died. Abdomen remained distended. Urine passed naturally but stools contained blood. No temperature. Death from exhaustion and peritonitis on sixth day.

CASE 3.—Sepoy, Punjabis; bullet, on Dec. 20th, 1915. Admitted 18 hours after injury. Entrance wound over left hip; no exit. Condition: Considerable pain in abdomen, also behind right trochanter. Abdomen stiff and tender. No history of vomiting. Not operated on. Urine drawn off clear early on 21st. Result: Died on 22nd.

CASE 4.—Cook, Indian General Hospital; shell wound. Wounded Dec. 13th in hospital and seen at once. One wound lower part of abdomen. Condition: Shock moderate. No vomiting. Much pain and tenderness. Rigidity slight. No signs of bleeding. No dullness in flanks. Pulse-rate not appreciably increasing. Operation 3½ hours later. Pararectal incision. Good deal of blood in peritoneal cavity and bleeding still going on from mesenteric vessels. Several holes in small intestine which were stitched up by Lembert sutures. Segment of shell found resting in recto-vesical pouch. Peritoneal cavity cleaned and drained. Result: Died next day from shock and hæmorrhage.

In this case operation was delayed a little to enable the patient to recover from the shock, but unfortunately, as so often happens, small mesenteric vessels continued to bleed and jeopardised his chances. An earlier operation would have stopped this, with perhaps a different result.

CASE 5.—Sepoy, Pioneers; bullet. Admitted Dec. 20th, 12 hours after injury. Entrance wound just to left of umbilicus; exit behind left flank. Rough journey to hospital. Condition: No notes. Operation about 14 hours after injury. Gut very badly damaged with bleeding from mesenteric vessels. Large amount of blood in cavity. Resection of 12 inches of small intestine. Peritoneal cavity was full of intestinal contents. Result: Died same evening, hæmorrhage and shock.

CASE 6.—Syce; bullet. Admitted Dec. 13th, 1915, 20 hours after injury. Lower half abdomen. No operation. Died Dec. 16th from peritonitis.

CASE 7.—Sepoy, Mahrattas; bullet, .377 uncased. Admitted Dec. 24th, 1915, five hours after injury. Entrance wound left buttock near middle line. Bullet could be felt subcutaneously 2 inches to left of umbilicus. Condition good, not much pain; some tenderness and rigidity. No note of vomiting. Facial expression normal. No signs of bleeding. Pulse and respiration unaffected. Operation one hour later, median incision. Peritoneal cavity was full of intestinal contents and very dirty. There were five holes in the small intestine, which were sewn up and the peritoneal cavity cleaned and drained. Result: Uninterrupted recovery; some hiccough on third day.

CASE 8.—Water-carrier; bullet. Admitted Dec. 28th, 1915, within two hours of injury. Entrance wound left flank. Exit same level 2 inches to right of umbilicus. Condition: Very pale and collapsed; no pulse. Operation not indicated. Result: Died within few hours.

CASE 9.—Sepoy; bullet. Too bad for operation; did not recover from shock and died next morning, Dec. 11th, 1915. Lower abdomen.

CASE 10.—Cook, Rajputs; bullet, lower abdomen. Admitted Dec. 11th, within two hours and died same day; too bad for operation.

CASE 11.—Arab coolie; bullet. Admitted Jan. 8th, 1916, within an hour of injury. Entrance wound somewhat large and ragged in left flank two inches above iliac crest; small piece of omentum protruding; no exit. Condition good, pain considerable. Tenderness and rigidity on right side of abdomen. No vomiting. No signs of bleeding. Operation two hours later. Incision transverse, muscle splitting, wound excised. There was some extravasation of the contents of the large bowel. Three holes in the descending colon stitched up and the peritoneal cavity cleaned and drained. Owing to condition of patient the operation was hurried. Bullet not found. Result: Next day abdomen was soft, but slightly distended and tender, but pulse fairly good. Vomited twice. Next day he was given solid food by his relatives, but nevertheless made an uninterrupted recovery and was running about in three weeks. He returned to full coolie work towards the end of March.

CASE 12.—Sepoy, Infantry; bullet. Admitted Dec. 19th, 1915, 24 to 36 hours after injury, lower abdomen. No operation; died next day.

CASE 13.—Sepoy; bullet; pelvis. Admitted Dec. 15th, 1915, about 48 hours after injury. No operation; died next day.

CASE 14.—Driver; bullet, lower abdomen. Admitted Dec. 13th, 1915, about 20 hours after injury. No operation; died next day.

CASE 15.—Dhooly-bearer, Field Ambulance; large Arab bullet. Admitted Jan. 1st, 1916, 2½ hours after injury. One wound only in left flank, mid-axillary line, just above crest of left ilium; no indication of direction save that he was standing up when hit. Considerable pain, right half of abdomen rigid and tender; no vomiting; bleeding probable. Operation one hour later. Incision in direction of external oblique, internal oblique split. There were several large holes in the small intestine, plus a rent in the mesentery, from the vessels of which considerable bleeding was taking place. The vessels were tied, two holes closed by Lembert sutures, and a piece of badly injured gut where there were three holes close together was resected, the ends of the intestine being joined by end-to-end anastomosis. Patient had lost a good deal of blood, and there was much shock. The bullet was not found. Rectal salines were administered. Result: Next day abdomen not distended, but somewhat rigid and tender; large amount of sanguineous fluid drained away; did not recover from shock and died at 2 o'clock.

CASE 16.—Lance-Corporal, Infantry; shrapnel wound abdomen and both arms. Admitted Jan. 15th, 1916, wounded about 4 P.M., seen two or three hours later. Entrance wound just to left of umbilicus, exit left buttock. Condition fair, bleeding doubtful. Operation, 8 P.M. Bleeding from torn vessels in pelvic mesocolon; four large holes in small intestine sewn up, and one in mesocolon; abdominal cavity cleaned and dried. Track of bullet went through iliopsoas just external to external iliac artery and through ilium. Wide patent track through buttock to external wound. Patient took anæsthetic badly, stopping breathing several times, and vomiting strenuously at end of operation. Result: On 16th abdomen still stiff, not distended; fair amount of sanguineous discharge. Good deal of pain. Pulse rapid and poor. No vomiting. On 17th abdomen softer and patient looking well, but died suddenly of heart failure at 2 P.M.

CASE 17.—Sepoy, Punjabis; bullet. Admitted Jan. 21st, 1916, one hour after injury, in very bad condition from shock and hæmorrhage; vomited coffee-ground material half an hour later. Entrance wound left side of back over tenth rib; exit left side of epigastrium. No operation; died during night.

CASE 18.—Sepoy, Punjabis; bullet. Admitted Jan. 21st, 1916, about one hour after injury. Entrance wound 3 inches to right of spine at level of costal margin; exit just above costal margin over tenth rib, the cartilage of of which was broken; omentum protruding. Condition not good; bleeding doubtful. Operation an hour later. Two wounds in hepatic flexure and two in liver stitched up. Good deal of blood exuded from liver. Result: Died 24 hours later.

CASE 19.—Sowar, Cavalry; bullet at long range. Admitted Jan. 21st, 1916, within an hour of injury. Entrance wound small, in left hypochondrium; no exit. Condition bad; blanched, very cold, and restless; pulse imperceptible at wrist. Abdomen moved freely but was somewhat distended; no dullness in flanks; no vomiting. No operation; died in half an hour from shock and hæmorrhage.

CASE 20.—Lance-Naick, Mule Corps; bullet, at long range. Admitted Jan. 21st, 1916, about an hour after injury. Entrance wound left flank; no exit. Condition bad; bleeding probable. Operation within an hour. There was one rent in the small intestine 2½ inches long in the long axis of the gut and two other smaller ones. The mesentery was torn and its vessels bleeding. All were stitched up. Result: Died during the night; shock and hæmorrhage.

CASE 21.—Private, Infantry; bullet. Admitted Jan. 21st, 1916, about seven hours after injury. Entrance wound right buttock, near middle line; exit midway between umbilicus and pubes, ½ inch in diameter, slightly to right of middle line. Condition: Very little pain. Abdomen rigid; pulse fair; no vomiting; urine clear. Treated expectantly. Next day some vomiting, otherwise condition unchanged. On the third day the abdomen was softer and almost painless, but slightly tender in the left iliac region, and he looked in fair condition, but he was vomiting bilious matter and his pulse was almost imperceptible at the wrist. He died later in the day. There is no doubt that this case should have been operated upon, and I regret I did not do it.

CASE 22.—Sepoy, Punjabis; bullet. Admitted early in December, 1915. Entrance wound left side back over tip of twelfth rib cartilage. Bullet extracted from abdominal wall 1 inch internal to and above right anterior superior iliac spine. There was much pain in the abdomen and in the sole of the right foot. There was no vomiting and never any blood in the stools or urine, but he passed urine with difficulty. There was paralysis of the left leg. This man recovered; he had no further abdominal symptoms, but his paralysis persisted with only very slight improvement.

Note.—This is the only case of a penetrating wound below the pyloric line that I have seen recover without operation, and even in this case it is possible that the bullet passed along beneath the fascia covering the psoas and iliacus. I count it, however, as a perforating wound.

CASE 23.—Arab girl, aged 8 years; bullet. Admitted Jan. 27th, 1916, about one hour after injury. Entrance wound right side epigastrium, small; exit just below costal arch 1 inch outside left nipple-line, 1 inch in diameter; omentum and about 12 inches of colon extruded. Condition fair, but restless and frightened; probably bleeding. Operation one hour later; one hole in splenic flexure, one large and one small hole in stomach. Under surface of liver torn. Bleeding vessel in stomach wall. Good deal of blood in peritoneal cavity. Result: Died same night, hæmorrhage and shock.

CASE 24.—Rifleman, Gurkhas; bullet, probably large. Admitted Feb. 2nd, 1916, about three hours after injury. Entrance wound right hip at tip of great trochanter; exit 2½ inches to left of umbilicus, large and lacerated, 2 inches in length. Condition fair, but evidence of bleeding; pain severe, some tenderness in abdomen. Operation: Median incision; much fresh blood in peritoneal cavity, from branch of superior mesenteric in torn mesentery. Six holes in small intestine, three large and three small. Result: Recovery; vomited twice during night; next day abdomen slightly distended. Third day, abdomen normal and not tender; troublesome cough, otherwise uninterrupted convalescence.

CASE 25.—Driver; bullet. Admitted Feb. 2nd, 1916, 2½ hours after injury. Entrance wound 2½ inches to left of umbilicus; no exit. Condition: Blanched, not much pain, but complained of pain and tenderness on right side of abdomen. Pulse small and increasing slowly in rate. Operation three hours later. There was a large quantity of blood in the peritoneal cavity; a large rent in the mesentery near the ileo-cæcal junction; the bleeding was coming from the ruptured ileo-cæcal artery. There were eight holes in the small intestine and one in the cæcum; all sewn up. Patient very collapsed. Rectal salines, &c. Result: Died shortly afterwards; death due principally to hæmorrhage.

Note.—It was very unfortunate that this case and the previous one came in at the same time and that both were bleeding, so that one of them had to wait. By the time the first operation was finished this man had lost a lot more blood, and died in consequence.

CASE 26.—Arab; bullet. Admitted Feb. 18th, 1916, half an hour after injury. Entrance wound 1½ inches above navel, ½ inch in diameter; exit wound outer edge of right erector spinæ, 2 inches above iliac crest. Condition apparently good, abdomen soft. Pulse normal rate and of good quality, but within half an hour, when ready for operation, the pulse had become very feeble and over 100 in rate and vomiting and restlessness had set in, evidently due to severe internal hæmorrhage. No operation. Patient died in the next half hour.

CASE 27.—Rifleman, Gurkhas; bullet. Admitted Feb. 20th, 1916, one hour after injury. Entrance wound small, over tip of left trochanter; exit 2 inches above and behind right trochanter, large, and tissues lacerated to considerable extent. Condition bad, much shock; severe pain in abdomen, generalised; no rigidity, but tenderness on pressure over hypogastrium. No operation. Death four hours later. No note of vomiting.

CASE 28.—Sepoy, Rifles; bullet. Admitted Jan. 29th, 1916, about 14 hours after injury. Entrance wound right buttock ½ inch from middle line at level of second piece of coccyx. No exit, but bullet could be felt beneath skin of abdomen 2 inches above pubes and to left of middle line. Condition fair; abdomen somewhat rigid and painful above pubes. Some dullness above pubes, ? bladder. Pain severe; lies on left side. Some bleeding from entrance wound. A catheter introduced before admission brought off bloody urine. No vomiting. Operation two hours later; median incision. Much bloody urine in peritoneal cavity, slightly fæcal-smelling. There was one hole at the apex of the bladder admitting tip of index finger and another in the base; from this the track led into the rectum. At this stage of the operation the patient stopped breathing, and despite all the measures we could take died on the table. This was most unfortunate as the prognosis seemed favourable.

CASE 29.—Sepoy, Rajputs; bullet. Admitted Feb. 11th, 1916, about 2 hours after injury; wounded in arm and abdomen. Had lost a lot of blood from the wounds in the arm. Entrance wound in abdomen in left flank just below costal margin in mid-axillary line. Exit, right side, 1½ inches external to margin of right erector spinæ midway between ribs and ilium. Condition poor, pulse weak; much pain on left side, no vomiting. Urine passed at 6.30 (wounded at 4) contained no blood. Abdomen stiff, especially on left side. No paralysis; said he was bending at time of hurt. Operation, 7.45 P.M.: Incision parallel to and 1½ inches below left costal margin; internal rectus split. There were some fæcal contents in peritoneal cavity; one hole, ¾ inch wide, in outer wall of descending colon. Result: Next day abdomen softer but pulse still bad. Died following day. Did not get nourishment ordered during night. His death was disappointing, but was largely due to the initial hæmorrhage.

CASE 30.—Sepoy, Sappers and Miners; bullet. Admitted Feb. 12th, 1916, 5½ hours after injury. Entrance wound 2 inches below right iliac crest just behind tensor fasciæ femoris, small. Exit just to left of and below umbilicus, 1 inch in diameter and bloody fluid exuding from it. Condition, much shock, pulse feeble. Great pain in abdomen, moderate rigidity. Advisability of operation very doubtful. Operation 1½ hours later. Peritoneal cavity full of intestinal contents, including recent food, grains of barley, &c. There were many large holes, eight or nine, some of which were complete rents of the small intestine, and none so small as to suggest that they could be closed by natural means. There was a good deal of blood in the pelvis, but no ruptured mesenteric vessel. All were sewn up. Pulse at the end of operation seemed no worse. Result: Did not rally and died next day.

CASE 31.—Havildar, Rifles; bomb from aeroplane. Admitted Feb. 13th, 1916, half an hour after injury. One wound, small, 2½ inches to right and below umbilicus; signs of hæmorrhage; pulse feeble and quick. Operated at once in the hope of stopping the bleeding. There was a large amount of blood and clots in the peritoneal cavity, and much fæces and a large rent in the cæcum. The man died half an hour after operation from hæmorrhage and shock.

CASE 32.—Sepoy, Pioneers; bullet. Admitted Feb. 14th, 1916. Wounded right flank. Operation within four hours. There was one small hole in the ascending colon near hepatic flexure with much bruising. Patient died on the third day. The notes on this case are, unfortunately, meagre.

CASE 33.—Sowar, Cavalry; bullet at long range. Admitted Jan. 21st, 1916, an hour after injury. Entrance wound over left hypochondrium, small; no exit. Condition bad; complained greatly of cold and was very restless. Abdomen moved freely on respiration, but was somewhat distended. No dullness in either flank. Pulse imperceptible at wrist. Died half an hour later.

CASE 34.—Water-carrier; bullet. Admitted Feb. 20th, 1916, 18 hours after injury. Entrance wound 4 inches behind and below right anterior superior iliac spine; exit, right chest, 2 inches below and external to nipple; probably pierced ascending colon and liver. Condition bad, facies anxious, had been vomiting. Abdomen painful over right half and over left hypochondrium, tender and very rigid. Pulse 95. No operation. Died next day from shock and peritonitis.

CASE 35.—Lance-Naick, Mule Corps; bullet. Admitted Feb. 20th, 1916, half an hour after injury. Entrance wound near middle line over fourth piece of sacrum. No exit, but evidence of bullet in abdominal wall 3 inches to right of umbilicus. Condition: Had been vomiting. Severe pain and lies on right side. Abdomen tender, but only moderately stiff. Pulse normal in rate and of very fair quality. Operation an hour later. Good deal of dark blood and clots in peritoneal cavity. There were nine holes in the small intestine and one in the upper part of the rectum. In two places the damage to the small intestine was so extensive that resection of 6 and 8 inches respectively was necessary; the others were stitched up by Lembert sutures. Patient took anæsthetic badly and died at end of the operation.

CASE 36.—Driver, Mule Corps; bullet. Admitted Feb. 22nd, 1916, within half an hour of injury. Entrance wound 4 inches behind right anterior superior iliac spine, small and round; exit 2 inches to right and a little below umbilicus, also small. Condition fairly good. Had vomited two or three times. Pain not severe, abdomen not rigid, but tender in right lower quadrant. Pulse slow and of fair volume. Operation half an hour later; incision medial to outer edge of rectus. There were a few ounces of blood in the peritoneal cavity and a little intestinal contents. Five holes in the small intestine, one of which was 1½ inches long, the others round and two of them small enough for purse-string suture. No special vessel was bleeding. Most of the blood appeared to have come from the wounds in the parietal peritoneum. Result: Recovery. Next day there was some distension and tenderness and the pulse was

feeble, but on the third day he passed a motion and the distension disappeared. The pulse improved and convalescence was uninterrupted.

CASE 37.—Arab coolie; bullet. Admitted Feb. 25th, 1916, two hours after injury. Entrance wound 4 inches below right nipple, no exit but a large round soft swelling 4 inches in diameter over ninth rib in mid-axillary line, left side; liver, stomach, and probably spleen involved. Condition poor; man aged 58, facies anxious, some bleeding from entrance wound, vomiting small quantities of mucus, &c. Very cold. Much pain in epigastrium. Upper abdomen rigid, but not very tender; lower abdomen soft. Pulse 85, small, soft, compressible. No operation. Died 3½ hours later.

CASE 38.—Lance-Naick, Mule Corps; bullet. Admitted Feb. 27th, 1916, three-quarters of an hour after injury. Entrance wound 3 inches to right of umbilicus; exit 3 inches below and behind left anterior superior iliac spine. Condition, 15 minutes after arrival, bad; considerable pain and good deal of tenderness, especially near entrance wound, but only slight rigidity. Pulse 90 and much worse than 10 minutes ago, evidently bleeding; 10 minutes later, 110 and weaker. Patient getting restless and cold, and vomited twice. No operation. Died an hour later.

CASE 39.—Private, Infantry; bullet. Arrived at dressing station only and died in 15 minutes. Wounded in lower abdomen from flank to flank. Death from hæmorrhage.

CASE 40.—Gunner, R.F.A.; bullet. Admitted March 1st, 1916, about 1½ hours after injury. Entrance wound 3 inches to right of twelfth dorsal spine; exit just over surface-marking of pylorus. Condition not good; considerable shock; had vomited. Great pain; abdomen absolutely rigid and very tender. Pulse slow and somewhat irregular; volume moderate; probably some bleeding; ¼ gr. morphia given. Operation 1½ hours later. There was a large longitudinal rent in pyloric end of stomach, 1½ inches long, and a similar one over pylorus itself. Much exudation of stomach contents and considerable amount of blood, most of which came from the liver, which had a small rent in it between the two lobes. Result: Vomited several times during the night. Next day abdomen still stiff and tender. Much bile on dressings. Pulse faster and weaker. Did not rally from shock and died same day.

CASE 41.—Sepoy; bullet. Admitted 3.30 P.M. on March 1st, 1916, 2½ hours after injury. Entrance wound right flank about middle of iliac crest; exit through left chest 1 inch external to nipple line at level of sixth rib. Omentum protruding through exit wound. Condition: Great pain and tenderness, but not much rigidity; had vomited. Pulse 95 and of poor volume, suggesting hæmorrhage. Operation within half an hour. Abdomen was absolutely full of fæces and blood, some of it from the liver. Very extensive damage to the transverse colon. Patient's condition did not admit of any complete operation, so the cavity was quickly cleaned and a hasty colotomy done, but he died in an hour, mostly from hæmorrhage.

CASE 42.—Private, Infantry; bullet. Admitted March 3rd, 1916, half an hour after injury. Entrance wound 2 inches above left trochanter. No exit. Man was in the act of defæcating when hit. Condition: Lay on right side, severe pain; very rigid, much vomiting; pulse slow and good. Operation half an hour later. There were 11 holes in the intestine, 3 in the large and 6 in the small, and 1 on each side in the pelvic walls, low down, below the internal iliacs, from which was considerable bleeding; no bleeding point found. Blood in cavity ½ to ¾ pint. Result: Remained in great pain and did not rally; died next day.

CASE 43.—Lance-Naick, R.F.A.; bullet. Admitted March 6th, 1916, half an hour after injury. Entrance wound 2 inches internal to right anterior superior iliac spine; exit left buttock 4½ inches below and behind left anterior superior iliac spine. Right forearm also wounded. Condition: Great pain, abdomen rigid, considerable bleeding. Pulse about 80 and of moderate volume. Not specially distressed. Operation half an hour later; rectus incision. Abdomen full of blood, mostly venous, the bleeding coming from wounds in gut and from four rents in mesentery, especially two of the latter. Five holes in small gut of varying sizes from ¼ to 1½ inches, 4 in mesentery. Result: Died 4 hours later, chiefly due to hæmorrhage.

CASE 44.—Sepoy, Punjabis; bullet. Admitted fifth day after injury. No operation. Died sixth day; peritonitis.

CASE 45.—Lance-Naick, Gurkhas; large bullet. Admitted March 11th, 1916, about an hour after injury. Entrance wound left flank; large, round. Complained of great pain; abdomen slightly tense; pulse very good and slow. No note of vomiting. Operation an hour later. There was a lot of arterial blood in the peritoneal cavity, mostly coming from an artery in the pelvic mesocolon; four holes in small intestine, four in mesentery, and two in rectum. Result: Did well at first; there was no distension. He passed fæces and urine naturally, and condition generally on the third day seemed very favourable, but on the fourth day there was distension, which was relieved a day later by small doses of mag. sulph. and turpentine stupes. On the 15th he started diarrhœa, which persisted for some days, and the discharge became somewhat offensive; the lower abdomen ceased to move with respiration and became tender and painful. He steadily went downhill unfortunately, and died rather suddenly on March 22nd. Possibly some of my stitches broke down, but I did not feel justified in opening him up again.

CASE 46.—Arab girl, aged 14; bullet. Admitted March 14th, 1916, 1½ hours after injury. Entrance under right flank, just above costal margin, 1 inch behind the mid-axillary line; exit 2 inches below xiphisternum. Small tag of omentum protruding from anterior wound. General condition not good; pain and shock, slight rigidity. Pulse slow and fairly good. Operation half hour later. One hole in hepatic flexure; a large hole and rent 4 inches long in right lobe of liver, 1½ inches from lower margin. Anterior portion of right lobe button-holed; gall-bladder bruised. Result: Did well at first, but developed pyo-pneumothorax and died on April 7th from septic exhaustion. There was no trouble with the intestinal condition; the abdomen remained soft and painless and the bowels normal.

CASE 47.—Private, servant; bullet, ·400 uncased. Admitted March 15th, 1916, within half an hour of injury. Entrance wound 2 inches below and 1 inch behind left anterior superior iliac spine; no exit. Condition: Great pain, especially around navel, and tenderness. Burning sensation extending from left iliac region to navel. Abdomen slightly tense; vomited once. Pulse slow and of fair quality. Operation half an hour later. Took anæsthetic badly. There were 2 holes in the pelvic colon; 2 semi-holes in the cæcum, near which lay the bullet; 3 holes in the small intestine, one 1½ inches the others ¾ inch in diameter; 2 large holes in the mesentery, one of which was bleeding. Result: Did not rally from shock and died 20 hours later.

CASE 48.—Sepoy, Infantry; bullet. Admitted March 17th, 1916, 10 hours after injury. Entrance wound 4 inches behind right anterior superior iliac spine; exit 2½ inches medial to it. Condition: Old man with pyorrhœa alveolaris. Great pain; abdomen very rigid; pulse about 90, poor. Had drunk 2 ounces of milk, given him by an orderly. Operation ¾ hour later; bleeding moderate. Good deal of extravasation of intestinal contents, mostly grass. Seven holes in small intestine, in size from a pea to half-a-crown; a small portion had to be resected. Pulse at end very bad. All possible shock measures taken. Result: Improved during first few hours, but died on following day.

CASE 49.—Sepoy, Infantry; bullet. Admitted March 19th, 1916, about 15 hours after injury. Sent in as gunshot wound of the thigh. Entrance wound to right of fourth vertebral spine; exit 1½ inches above middle of right Poupart's ligament. Condition: Pale, anxious, and tired-looking. Abdomen distended and tense; considerable pain and tenderness. Pulse slow and good. Operation an hour later; paracentral incision. Considerable amount of blood diffused in peritoneal cavity. Small intestine blown up. Two holes in cæcum: one ¾ inch, one ¼ inch; local peritonitis. Result: Recovery. Distension persisted for a couple of days, but began to disappear after a simple enema in the evening of the second day.

CASES 50, 51, 52.—Private, sergeant, and private. All wounded by bomb which fell in hospital. In No. 51, who was operated on first, there was prolapse of several feet of small intestine and the cæcum, a 3-inch hole in the parietes, and another of 1½ inches. There were three holes in the small intestine, and the cæcum was badly torn and bruised. The small holes were stitched up and a colostomy done. In No. 50 there were four holes in the small intestine and a piece of bomb was removed from the gut. No. 52 bled a lot before he could be attended to, and had sustained damage to the cæcum and the small intestine. All died within the next two days.

CASE 53.—Arab; bullet. Admitted March 23rd, 1916, within an hour of injury. Entrance wound 1½ inches above left trochanter; no exit. Condition: Poor, aged 55, pyorrhœa alveolaris; pulse slow but poor volume and tension; bleeding probable. Good deal of shock. Operation 1½ hours after injury. Large quantity of arterial blood in peritoneal cavity, also a large round worm and other intestinal contents. One large rent and one smaller hole in small intestine. Entrance and exit wounds in recto-vesical pouch, from which some bleeding. Result: Died next day, mostly due to hæmorrhage.

CASE 54.—Sepoy; bullet. Admitted March 23rd, 1916, at 10 P.M., soon after injury. Entrance wound 2½ inches above posterior superior iliac spine. No exit, but bullet lying under skin near McBurney's spot. Condition good. No vomiting. Operation, 11 P.M.; diagonal incision. One small hole in cæcum stitched up; bullet removed. Result: Uninterrupted recovery.

CASE 55.—Sepoy, Infantry; bullet. Admitted 2½ hours after injury. Entrance wound 2 inches above and behind left anterior superior iliac spine. Exit 4 inches behind and 2 inches below right anterior superior iliac spine. Condition poor. Pulse 70, poor. Abdomen painful, rigid, and tender; considerable shock. Decided not to operate unless improvement set in. An hour later pulse 90 and worse. No operation. Died in 6 hours.

CASE 56.—Sowar; bullet. Admitted three or four days after injury. Abdomen swollen and distended. Laparotomy undertaken for drainage. There was a hole in the transverse colon and the omentum was gangrenous. Pus in abdominal wall and in peritoneal cavity. Death three days later.

CASE 57.—Private, Infantry; bullet, .400 uncased. Admitted half an hour after injury. Entrance wound 1 inch to right and below umbilicus; no exit. Condition: Very restless and shocked, pale, anæmic. Pulse small, soft, slow. Abdomen very painful and somewhat rigid; had vomiting severely. No operation. Died next morning; hæmorrhage and shock.

CASE 58.—Naick; bullet. Admitted March 28th, 1916, 2½ hours after injury. Entrance wound 2 inches above and medial to left anterior superior iliac spine; exit 5 inches below and behind right anterior superior iliac spine. Great pain, some rigidity and tenderness, no vomiting. Not blanched. Pulse 70; not too good. Operation an hour later. Loss of blood not excessive. Ten holes in small intestine; one in large, descending colon. The ten former were stitched up, the latter left as colotomy owing to condition of patient. Result: Pulse very variable during operation; very restless afterwards. Died third day from shock.

CASE 59.—Lance-Naick; bullet. Admitted March 29th, 1916. Entrance wound near twelfth dorsal spine; no exit. Great pain in epigastrium and tenderness. Slight rigidity in upper abdomen; no vomiting. Pulse very poor, 80, small, low tension. Died same night, probably hæmorrhage.

CASE 60.—Arab girl, aged about 8; bullet. Seen in her home about 2 hours after injury, when there were no abdominal symptoms and viscera were thought to have escaped. Entrance wound 1½ inches above pubes 1 inch to left of middle line; exit right hip 2 inches behind anterior superior iliac spine; ? injury to bladder. Next morning, 17 hours after injury, symptoms of peritonitis; temperature 103° F. Operation: Two small holes in bladder, one in small intestine around which peritonitis. Patient died suddenly four hours later. This case should have been saved; thorough exploration of the wound would probably have revealed the condition and have been followed by operation.

CASE 61.—Private, Infantry; bullet. Admitted March 30th, 1916, 45 minutes after injury. Entrance wound 2 inches behind left anterior superior iliac spine; no exit. Had had morphia. Sitting down when hit. Condition: Semi-blanched and sweating. Comfortable, little or no pain. Abdomen fairly soft, no tenderness. Pulse imperceptible at wrist. Died same afternoon.

CASE 62.—Sepoy, Rajputs: bullet, April 1st, 1916. Seen within few minutes. Lower abdomen; prolapse of omentum; vomited, no rigidity, bleeding pulse. Died in half an hour.

CASE 63.—Similar case, lower abdomen. Died in 15 minutes, probably hæmorrhage.

CASE 64.—Sepoy, Punjabis; bullet. Admitted April 11th, 1916, half an hour later. Entrance wound 1 inch to outer side of left posterior superior iliac spine; no exit. Was standing up when hit. Condition, shocked; great pain in stomach; had been given opium. Hands cold. Abdomen tense and tender all over. Pulse 75, regular, fair volume, low tension. Considered not bleeding seriously, and decided to await recovery from shock. Seven hours later pulse better; tenderness referred especially to right side abdomen. Operation an hour later—i.e., 8½ hours after injury. Hæmatoma in right abdominal wall. Considerable amount of blood in peritoneal cavity. Good deal of peritonitis on several coils of intestine; ·400 uncased bullet found lying in peritoneal cavity. Six holes in small intestine, four of them large; one in mesentery. Stood operation well, but pulse irregular at times. Result: Recovery. Some slight distension first two days, and ran temperature from fourth to seventh day; some cough for few days.

CASE 65.—Sepoy, Sappers; ·303 bullet, self-inflicted. Admitted half an hour afterwards, on April 13th, 1916. Entrance wound ½ inch to left and above umbilicus, omentum protruding and venous blood exuding on movement; exit 2½ inches left of middle line at back, same level. Both wounds small and round. Patient very pale, cold, restless, and pulseless. Abdomen soft, not tender. Died in half an hour; hæmorrhage.

CASE 66.—Sweeper, Infantry; bullet. Admitted April 16th, 1916, half an hour after injury. Entrance wound 2 inches above left costal margin, just outside nipple line; exit 2 inches below right costal margin 1½ inches outside nipple. Left rib broken; arm wounded. Condition fair, no vomiting. Abdomen semi-rigid and very tender. Pulse 80, ? increasing in rate, fair quality, some sweating. Operation half an hour later; moderate amount of blood; some bile and good deal of stomach contents. Three holes in stomach, ½ to 1 inch long, two in gall-bladder. Gastro-hepatic omentum torn, whence some bleeding. Small rent in liver, of which bleeding stopped. Both sacs drained. Result: Died third day.

CASE 67.—Lance-Naick, Punjabis; bullet. Hit midnight April 18th, 1916. Wounds side to side near iliac crests. Brought into regimental hospital in early morning with distended abdomen, greatly diminished liver dullness. Thin pulse, 45; body cold. At the general hospital at 10 o'clock. No pulse at wrist, carotid 120; dull in both flanks. Breathing laboured. Abdomen rigid and tender. Died at 2 P.M.

CASE 68.—Arab; bullet. Admitted April 18th, 1916, 21 hours after injury. Entrance wound left of spine; exit left flank. Abdomen tympanitic and tender in lower part. Pulse small, weak and 140. Frequent vomiting. Taken to his home and died next day.

CASE 69.—Driver; bullet. Admitted April 20th, 1916, 5½ hours after injury. Entrance wound over McBurney's spot; exit tip of left great trochanter. Facies anxious and drawn, anæmic; much vomiting. Abdomen tense and tender. Pulse 105, small, low tension and volume. No operation. Died next day.

CASE 70.—Sepoy; bullet. Admitted April 24th, 1916 3½ hours after injury. Entrance wound over McBurney's spot; exit middle left gluteus maximus, both very small. Condition: Great pain, facies very anxious, abdomen tense and very tender; pulse 85, fair volume, but very low tension; vomited later. Operation not advised. Died third day; peritonitis and hæmorrhage.

CASE 72.—Private; bullet. Admitted April 26th, 1916, 2 hours after injury. Entrance wound to left of posterior superior iliac spine; exit 2 inches below umbilicus, bleeding. Great pain, facies anxious, vomiting. Abdomen slightly tense and tender. Pulse 88 and increasing in rate; restless. Died few hours later.

CASE 74.—Lance-Naick, Punjabis; bullet. Admitted April 25th, 1916, 1½ hours after injury. Entrance wound small, tip of left trochanter; exit 1 inch above pubes, 1 inch to right of middle line. Condition: Facies slightly anxious, much pain; vomited twice. Abdomen somewhat rigid, tender, and slightly tympanitic. Pulse 70, full, very fair quality. Operation half an hour later; oblique incision, muscle splitting, good deal of clot and blood in pelvis, and some intestinal contents. Two small holes in small intestine and two in parietal peritoneum over top of bladder. Result: Uninterrupted recovery.

Other lower abdomen cases in Kut were two communicated by Captain M. L. Puri, I.M.S., which both died without operation, one from bleeding and the other from peritonitis; one by Captain W. C. Spackman, I.M.S., in which a small bullet passed through from loin to scrotum. There was great pain, intense desire to micturate, and thirst; the pulse, at first good, rapidly increased in rate, and death occurred in 2½ hours.

There were six cases under the late Major F. C. Lambert, R.A.M.C., in the British Hospital before he so unfortunately contracted his fatal illness. One was operated on and all died; the operated one bled a lot from the splenic vessels. Captain King described three cases. One was a lower abdomen and died with a fæcal fistula in eight days; the second was wounded in the epigastrium and died in 24 hours, mostly from hæmorrhage; he vomited. The third was a bomb wound over the liver, with no involvement, as far as could be made out, of the intestine; he recovered. None was operated on.

Cases of Wounds above the Transpyloric Plane.

CASE 86.—Arab, Jan. 1st, 1916. Entrance wound 2 inches below xiphisternum; exit 3 inches above right costal margin. Apparently liver only. No operation; was walking about on third day.

CASE 87.—Arab boy, Feb. 15th, 1916. Entrance wound 2 inches above right costal margin, anterior axillary line; no exit. Pain right side; semi-rigid abdomen. Operation: 3-inch rent in liver, sewn up by thick catgut sutures; good deal of blood in peritoneal cavity, but bleeding was stopping. Recovery. Some trouble with wound in pleura for some time.

CASE 88.—Sepoy. This occurred in India some years ago. The man was hit at a few yards distance on the rifle-range. The bullet entered just about over the surface marking of the pylorus, and the exit was at a corresponding position at the back. There were no untoward symptoms at all, and the man was well in a few days.

Conclusions.

1. The mortality in penetrating wounds of the abdomen below the transpyloric plane is very high, about 97 per cent.
2. Slight symptoms or small wounds do not justify conclusion that internal lesion may be slight or harmless. On the contrary, it should be assumed that a penetrating wound means serious damage and probably fatal damage.
3. Laparotomy should be the routine treatment for these cases, provided the condition of the patient is good enough for a major operation.
4. Hæmorrhage is the most serious complication of these wounds.
5. Operation should be done at once if serious bleeding be taking place. The pulse is the best guide to this, and needs watching most carefully.
6. It is not worth while, as a rule, to operate if over 12 hours have elapsed since the infliction of the wound.
7. Wounds above the transpyloric plane may sometimes be treated expectantly, especially those apparently involving the liver only.

THE PHENOMENA OF ANAPHYLAXIS.

BY S. WYARD, M.D., B.S.LOND., M.R.C.P.,
CAPTAIN, R.A.M.C.

THE extended use at the present time of prophylactic and therapeutic injections of antisera brings into especial prominence the condition of anaphylaxis. The liability to the establishment of this condition calls for care in the administration of the sera and for some idea of the mechanism of the reaction in order that rational steps may be taken to minimise or remove the danger that may be apprehended. That anaphylaxis may ensue on suitable treatment with bacterial vaccines has been recognised since the work of Rosenau and Anderson in 1907, but is clinically of little importance on account of the minute quantities of bacterial protein used for vaccination purposes—amounts insufficient to make a toxogenic dose. In the case of diphtheria antitoxin the matter is quite otherwise and is of considerable moment, since there have been many cases reported of severe illness after injection of this serum. A few cases even of death have also been recorded. The question is now especially acute in relation to tetanus, that most terrible disease towards the eradication of which very energetic efforts are at present being directed. And the question arises because a single prophylactic dose of tetanus antitoxin is being given to every man wounded in battle. When, therefore, it is later deemed desirable to give further prophylactic doses or, symptoms of tetanus being manifest, larger therapeutic doses, the medical officer must decide as to the possibility of anaphylaxis following and either trust to luck that no ill-effects are produced or take anti-anaphylactic measures.

The present state of our knowledge—or should it rather be ignorance?—does not allow of any real and satisfactory definition of anaphylaxis. It seems more than possible that the phenomena now included under that head are in reality manifestations of two or more processes. The condition may be provisionally described as one of greatly increased sensitiveness of the animal organism to the introduction of foreign protein, so that injections of the latter in amounts which are innocuous to controls produce in the hypersensitive animals symptoms of varying intensity and even acute death. Such a state of hypersusceptibility may be idiopathic to the individual in a few rare cases, while in others sensitisation may be accidentally effected in ways which are only now coming under suspicion. In addition, many of the clinical symptoms of human disease have been attributed to anaphylaxis, but the term is usually employed to denote the acute shock seen in animal experiments, the serum disease of man, and some diagnostic reactions such as those with tuberculin, mallein, &c., and can at present be applied with any degree of certainty to these conditions alone.

The Phenomena of Anaphylaxis.

The Theobald Smith phenomenon is the point from which started the real investigation of this condition. He noticed that guinea-pigs treated with neutral mixtures of diphtheria toxin and antitoxin became subsequently hypersensitive to injections of normal horse-serum, and it was soon shown that the sensitisation was due not to the toxin or antitoxin but entirely to the normal protein constituents of the serum. From this it was but a short step to demonstrate that anaphylaxis may be effected by any protein substance—e.g., egg-albumen, milk, bacteria, &c. In conformity with the general terminology of immunity, these substances are called antigens. It has further been shown that all antigens are protein in nature, and it is almost conclusively proved that no body other than protein is capable of acting as an antigen.

Turning first to the purely experimental side of the question, it will be well to consider the method by which sensitisation of animals is effected and the results of second injection into such sensitised animals. The first experiments in this direction were those of Flexner, Richet, and one or two others, who showed that rabbits and dogs injected with a foreign serum died after a second injection of a sublethal dose of the same serum. The first dose is called the sensitising and the second the toxogenic. These workers used a substance toxic in itself, but even so, it was found that the toxogenic dose caused death in such small amount as failed to do so in untreated animals. It remained for later observers to show that precisely the same effect ensues upon the use of proteins in themselves quite harmless. It has been further found that animals of different species vary greatly in the ease with which they are sensitised—e.g., guinea-pig, horse, and goat fall an easy prey to the condition, rabbits and dogs are less susceptible, and mice almost or completely refractory.

The amount of protein required for a first dose varies within very wide limits, sensitisation having been effected by extremely minute quantities, even as small as 0·000·001 c.c., and there is apparently no limit in the other direction so long as it be not in itself incompatible with the life of the animal. The second or toxogenic dose may likewise vary indefinitely upwards, but the minimal dose is at least 100 to 1000 times larger than that for sensitisation, and is for guinea-pigs some 4 to 5 c.c. These figures refer to such antigens as possess no inherent toxic properties; where the antigen is itself a poison much smaller amounts may be used for the second injection.

The hypersensitive state does not supervene immediately upon the sensitising injection—a certain definite interval must elapse before the animal becomes anaphylactic. In the earlier days of the investigation it was generally thought that this interval varied with the size of the sensitising dose, that the smaller the amount of antigen used the shorter the period required for the full development of the condition and as the amount of the antigen was increased so the period lengthened. More recently, however, it has been shown that no such definite relationship exists and the average time after a moderate-sized first dose is from 12 to 14 days, although after a massive first dose sensitisation may be more or less delayed.

The route by which the foreign protein is introduced into the animal is a matter of some importance. As regards the sensitising dose the usual route is intravenous or subcutaneous injection, but any method will succeed that ensures the penetration of the antigen to the physiological interior of the body. The possibility of effecting this by the alimentary canal seems now fairly certain since it has been shown that protein fed to animals in large quantities is later demonstrable unchanged in the blood. Generally, however, gastric and pancreatic digestion will so alter the constitution of such substances that no sensitisation is possible except in abnormal circumstances where the processes of digestion are interfered with, when it appears that unaltered protein may pass into the large gut, be there absorbed to some extent, and so sensitise the animal. In the case of the toxogenic dose greater variability prevails, and antigen administered by the mouth or per rectum never produces anaphylactic shock,[1] for which purpose parenteral injection must be employed. The most certain methods are intracerebral and intravenous injections, next intramuscular, then intraperitoneal, intrapleural and subcutaneous, and finally intrathecal.[2] The intracerebral route is peculiar in that it

[1] This statement needs modification in view of the fact that the disease produced in some persons by the ingestion of strawberries, eggs, &c., has been attributed to anaphylaxis.

[2] Although this has been often maintained it seems sufficiently doubtful to warrant all care in using this route in human therapy. Hutinel has reported four deaths from anaphylaxis consequent upon intrathecal injection of antimeningococcus serum, and Besredka and Lisofsky have produced the same effects with normal horse-serum in guinea-pigs. They have thus shown that these animals may be either sensitised or intoxicated by the intrathecal route.

appears less suitable for sensitisation than the other routes; but if the toxogenic dose be given in this way, the shock appears sooner and in greater intensity than in other circumstances.

The anaphylactic reaction resembles all other immunity reactions in its specificity—i.e., specificity is not absolute. An animal sensitised to one particular antigen, in addition to reacting with a second dose of the same substance, may also react to another but closely allied protein but with a quantitative difference—to obtain the same intensity of reaction a much larger quantity of the heterologous substance than of the homologous must be administered. In short, there is much evidence in favour of the view that the toxin responsible for this reaction is in no way specific, but that all antigens give rise to the same poison. The specificity observed is due only and entirely to the specific antigen-antibody complex occurring in each case (*vide infra*). Pointing to the same conclusion is the fact that a non-specific anti-anaphylaxis (refractory period) may be produced by injection of a hypersensitive animal with peptone. It has also been shown that the same animal may be at one and the same time sensitised to a number of different antigens.

The manifestations of anaphylactic shock vary with the species of the animal experimented upon. The essential features are as follows. The onset is sudden and immediate (within a few minutes). The guinea-pig becomes obviously uneasy, with restlessness and sneezing, while the respiratory rhythm increases in rate. This may be followed by discharge of urine and fæces, and the appearance of marked muscular weakness. Later respiration becomes irregular and laboured, inspiration is obviously extremely difficult, and the chest remains permanently expanded, never contracting fully. Death may ensue in a convulsion or by coma, in which the breathing gradually becomes slower and more shallow, until finally it ceases altogether. The condition is evidently due to interference with the respiratory functions. In rabbits symptoms appear after a short interval of a few minutes or more, the animal first showing marked muscular weakness with discharge of urine and fæces. The weakness increases until no voluntary muscular effort is possible but convulsions may occur. Death is due to asthenia. Anaphylactic shock is manifested in dogs first by restlessness, vomiting, and the passage of urine and fæces. General weakness rapidly ensues followed by twitching and laboured and irregular breathing. There is rapid and extreme fall in the blood pressure, and cerebral anæmia causes death. Generalised tremor, great weakness, laboured respiration, and incontinence of urine and fæces are the symptoms of anaphylaxis in horses and goats.

The symptomatology, &c., of human anaphylaxis is discussed in a later paragraph.

The pathology of this condition has been thoroughly worked out by numerous investigators, especially Auer and Lewis, and Pearce and Eisenbrey. It appears due to a toxic substance in the elaboration of which the liver plays some part and its action is probably not central, i.e., upon the central nervous system, but peripheral, upon the nerve endings or the muscles themselves. In guinea-pigs the predominant change is an extreme contraction of the muscles of the bronchioles so that no air can enter the pulmonary alveoli, in consequence of which and the extreme thoracic expansion the lungs are, after death, found blown out and inelastic, with the alveoli distended and many of the septa torn. There are, in addition, more or less numerous visceral hæmorrhages. Section of both vagus nerves does not alter these findings, showing that the action is not within the brain or medulla. In dogs the effects are practically limited to the vascular system, and it has been shown that the action is upon the vaso-motor nerve endings, since if these have been previously paralysed no further fall of blood pressure occurs during anaphylactic shock, while a fall produced by anaphylaxis is diminished by the exhibition of drugs which stimulate the muscularis of the blood-vessels.

Little can be said as to the nature of the toxin responsible, since but little is known concerning it The striking analogy between the manifestations of peptone poisoning and those of anaphylaxis have been pointed out by many, and some have maintained that the latter is due to the action of a peptone. This is not impossible in view of the results obtained by Vaughan and Wheeler with the products of proteolysis—protein split-products; but no real deductions can be made from the phenomena of peptone poisoning in this connexion owing to the fact that the only samples of peptone available are composite mixtures of many substances, and their composition varies within very wide limits. Rosenau and Anderson came to the conclusion that none of the known antibodies (precipitins, &c.) is responsible for anaphylaxis, but later observations by Doerr and Russ point to the fact that precipitins are in reality a prime factor in the production of the condition.

It is of interest to note that the above method is not the only one by which anaphylaxis can be produced; it is the condition of active anaphylaxis, but the passive installation of the state is also possible. By infusion of a normal animal with the serum of one sensitised the former is rendered sensitive, while it has also been shown that the young of a hypersensitive mother are in the same condition, and that whether the maternal sensitisation be effected before conception or during pregnancy. In such circumstances it does not usually persist for any prolonged period. Transference takes place by means of the placental circulation and not by the milk. Further, Schenk has described inheritance of this condition by the young of normal females impregnated by sensitised males, but this needs confirmation before it can be accepted as fact.

The duration of the anaphylactic period—i.e., the length of time after a sensitising injection during which the animal remains liable to the shock on a second injection—is still in some doubt. Its time of onset, as stated above, is usually 12 to 14 days, and animals have still been found sensitive after as much as three years. It is, therefore, no transitory state and persists for very considerable periods, but whether the intensity of the sensitisation diminishes with age, whether with time it may disappear altogether, and, if so, when such decrease commences and when it is complete, have not yet been worked out. It is thus obviously necessary in dealing with man always to assume the possibility of anaphylaxis resulting if the individual has at any time previously received a dose of antigen capable of rendering him sensitive.

Closely allied to, if not identical with, the phenomena described above is the serum disease of man, which may assume either of three forms. The first to be described was that occurring after a single large dose of serum, and symptoms appear 8 to 12 days after the injection. They are numerous and varied, the commonest being urticaria, often involving a large part of the surface area, sometimes practically all. Other rashes—morbilliform or erythematous—are sometimes, but more rarely, seen. At the same time joint pains are common, and there may be swelling and tenderness of the lymphatic glands associated with the site of injection. Some pyrexia and occasionally slight albuminuria may be associated. The symptoms pass off in from 12 to 48 hours. The second form is the *accelerated* reaction so called because it appears earlier than the above—viz., 4 to 8 days after the second injection. It does not occur after a first injection. The symptoms are similar to those just described, but are more acute, and generally pass off within 12 to 18 hours. As a rule, neither of these forms is of serious import, but now and then may be very severe or even fatal.

The third form—the *immediate* reaction—is the same as that seen in experimental animals. Symptoms supervene within a very short time of the second injection. At present, however, the whole subject of serum disease is in a very unsatisfactory state, and a large amount of work remains to be done upon the subject. Little or nothing is yet known concerning the effect of differences in the size of the first dose or of the second, or of changes in the ratio one to the other. Further, it appears necessary to distinguish between the local effect of the injected antigen and its systemic—anaphylactic—effect. Nothing has yet been done in this direction. Finally, there is the question as to the liability to anaphylaxis after multiple injections, and if it does occur in such cases are the symptoms the same or in any way modified? I am at present engaged upon making observations with a view to throwing light upon these points.

As regards liability to anaphylaxis man appears to occupy an intermediate position in the range of animals, being less susceptible than guinea-pigs, probably less even than dogs and rabbits, but more so than mice. It is of interest, however, to note that the symptoms produced in man approximate closely to those seen in guinea-pigs, and the pathology is probably essentially the same in both cases.

The onset of symptoms is sudden and after but very short delay—generally within half an hour. First appear local pain and tenderness, and the site of injection becomes swollen, red, and hot. The swelling may be very marked, and where the upper arm is used may extend from shoulder to wrist. Irritation with an intense desire to scratch the part may be a prominent symptom. On the other hand, the systemic phenomena may be intense without any or all such local changes. Suppuration never occurs (except infection be effected by faulty technique), and the part becomes normal within 24 to 48 hours. Almost at once the patient complains of difficulty in breathing, the chest becomes expanded and almost rigid, inspiration is particularly impeded, the face may become swollen and congested, the mucous membranes cyanosed. Auscultation of the chest shows the normal vesicular breath sounds replaced by a high-pitched broncho-vesicular murmur. Moist sounds are not heard. Extreme urticaria, as in the ordinary form of serum disease, is sometimes seen at the same time. In cases slightly less severe the patient will sit up labouring for breath and racked by a frequent, almost continuous or paroxysmal, dry cough. Relief comes as suddenly as the onset, and in 15 to 30 minutes the patient is to all appearances normal.

As to sensitisation of man it is still impossible to make any definite statements. After considerable doses very many times repeated the anaphylactic state may appear within four or five days, whereas after two or three small doses (4 to 5 c.c. per dose) it may still be absent 28 days after the last. A single injection of 3 to 5 c.c. does not sensitise, and persons receiving massive injections are not, or at all events not always, hypersensitive after six weeks.

Theories of Anaphylaxis.

To explain the phenomena of anaphylaxis several theories have been from time to time propounded, but most of them have in one respect or another been found wanting. Adequately to deal with all such theories is impossible in the present circumstances, and, moreover, is not called for by the object in view. Without, however, entering minutely into details of experiments, it is perhaps well to outline the more important of the theories put forward and to indicate wherein they fail.

Gay and Southard, believing that every antigen consisted of two distinct portions, supposed that during the interval between the sensitising dose and the appearance of the hypersensitive state one of these portions—the toxic—was eliminated from the body, while the other—the sensitising—was retained. The latter, acting in some way not yet known upon the body cells, rendered them capable of assimilating the toxic moiety of the antigen, whereas before they were incapable of so doing. In consequence, when the toxogenic dose is administered to a sensitised animal, rapid assimilation of the toxic element by the body cells takes place with resulting anaphylactic shock. As will be seen later, anaphylaxis may occur without active participation of the cells but entirely in the blood, and, further, during the manifestation of the symptoms complement or alexin disappears from the blood, and it has been shown that the complement is an important element in the production of anaphylactic shock. These facts are obviously not accounted for by the theory of Gay and Southard.

A second theory dependent upon the assumption of the existence of two distinct elements in the antigen is that of Besredka. The one he terms "sensibilisinogen," which in the body gives rise to the formation of an antibody, *sensibilisin*. The second element he calls "anti-sensibilisin," which after the first injection is excreted from, or destroyed in, the animal, but after the second injection reacts with the *sensibilisin* with the production of a toxic substance responsible for the subsequent symptoms. This theory becomes untenable in view of the fact that it goes counter to all the known principles of immunity in that it supposes the production of a specific antibody which reacts *not* with its antigen but with another substance altogether.

The above theories received some support when it was found possible to separate by physical means (fractional precipitation, heat, &c.) sensitising and toxic portions from protein substances. These results, however, have not been confirmed, and other workers state that no such preparation is possible, and that the sensitising and toxic molecules are one and the same. On the other hand, Vaughan and Wheeler have effected such a separation by chemical means. But, even so, the objections enumerated above remain unaffected. Bringing about proteolysis by alkaline alcohol, these two obtained from protein toxic and non-toxic split-products, and therefore supposed that a first injection of antigen leads to a slow lysis by which the non-toxic substance is liberated. This in turn gives rise to the production of an enzyme—a lysin—which, acting with greater rapidity and intensity upon the second injection, liberates comparatively large amounts of the toxic body. Anaphylactic shock results from the action of this latter. The theory is more complete than either of the preceding, since the assumption of a preliminary lysis allows for the part of the complement in the reaction. Friedberger's later theory supplements this and reconciles it more thoroughly with all the facts.

Richet suggests the theory that the first injection of antigen causes the production of a substance, *toxogenin*, and that after a second injection this reacts with the fresh antigen to produce the anaphylactic poison, *apotoxin*. As will be seen immediately, this is but a somewhat crude foreshadowing of Friedberger's second conception, and there is no need to postulate the appearance of a distinct and specific toxogenin since complement and antibody are capable of performing all the reactions attributed to it by Richet. Friedberger's anaphylatoxin too is but Richet's apotoxin under another name.

Bringing anaphylaxis into line with Ehrlich's theory of immunity, Friedberger formerly suggested that the condition was one step towards immunisation. According to Ehrlich, the presence in the body of a foreign protein calls forth the production of side-chains which unite with and neutralise the antigen. These side-chains are formed by and in the cells in excessive numbers which, in the ordinary course of events, are cast off into the general circulation. Friedberger postulates that in certain circumstances the side-chains or receptors remain sessile upon the cells. This appears the more likely if Adami's theory be accepted that the production of receptors is a function of the nucleus from which they pass into the cytoplasm before reaching the blood. It might easily be that for some reason they are held up in the intermediate position. Such a cell would obviously be in a hypersensitive state—the larger number of receptors would attach a greater amount of antigen with a correspondingly greater toxic effect. The same objections, however, are applicable to this theory as to those of Gay and Southard and Besredka—viz., that it does not go far enough and fails to account for all the facts. It is, moreover, doubtful in the light of more recent knowledge whether Ehrlich's theory be the correct explanation of immunity reactions; the weight of evidence appears against it.

Nicolle believes anaphylaxis to be due to the resultant of the action of two substances—an albuminolysin and an albuminocoagulin. Sensitisation causes production of the former out of all proportion to the latter, hence the antigen of the second dose undergoes rapid lysis with the formation of toxic substances. All recent work, however, points to the fact that albuminocoagulin—precipitin—so far from being protective is actually the prime cause of the condition.

Lastly, there remains Friedberger's later theory which, better than any other, reconciles all the known facts and probably approaches nearest to the truth. The blood of an animal showing symptoms of anaphylaxis possesses no, or very little, complement, but that the condition is not due merely to lack of complement is shown by the fact that no modification is effected by the injection of fresh guinea-pig's serum simultaneously with the second dose of antigen, indicating also that complement is fixed in this condition. What is the explanation? Friedberger found that complement is able to form from antigen a toxic body which, injected into a normal animal, gives rise to all the phenomena of anaphylactic shock. But while complement alone is capable of effecting this change to a slight extent, the toxic product appears with far greater rapidity and in far greater quantity if the specific antibody be also present, and this has been confirmed by several other workers, amongst them Thiele and Embleton, who believe that they have traced the direct development of the antibody from normal complement. The toxic substance produced in this manner has been called *anaphylatoxin*. The success of the experiment depends upon three factors—the quantities of complement and antibody, relative to one another and to the quantity of antigen; the time during which the substances are allowed to react; and the temperature at which they are kept. As

regards the first, there is a certain definite range within which (for a given amount of antigen) complement and antibody give rise to anaphylatoxin, but outside which—i.e., if either be in excess or deficient—the toxin does not appear. If the time allowed be insufficient the mixture remains innocuous; if the time be extended beyond a certain limit the mixture becomes innocuous. The disintegration of the antigen proceeds so far that the toxic substances are still further split up to simpler non-toxic compounds. Finally, the lower the temperature the slower the production of anaphylatoxin, the optimum temperature being 37° C. when it is produced in greatest amount and at the greatest rate. Moreover, it is found also that the reaction causes complement fixation—i.e., the complement-antibody-antigen mixture after the formation of anaphylatoxin contains less complement than was put into it, perhaps none at all. Friedberger, therefore, holds that the first injection of an antigen brings about an increase in the antibody present, which, together with the complement normally contained in the blood, immediately reacts with the second dose of antigen, so liberating anaphylatoxin.

That the process is not absolutely so simple as this is shown, however, by an experiment by Pearce and Eisenbrey, who exsanguinated a sensitised dog and replaced its blood by that of a normal dog, while the blood removed from the former was used to transfuse a third (normal) dog previously bled sufficiently to avoid plethora. They thus had a sensitised dog containing normal blood and a normal dog containing sensitised blood. Injection of a toxic dose of antigen into each caused death of the former and no symptoms in the latter, showing that the tissue cells are capable of producing the specific poison. This is only to be expected when it is remembered that the antibody is produced within these cells, and naturally, therefore, they would contain that substance to excess after sensitisation. It is thus evident that, as a rule, both the cells and the serum play their part in the reaction of anaphylaxis.

This theory supplies a simple explanation of all the known phenomena in question and shows their relation to the previously discovered processes of immunity—i.e., accounts for it as a true antigen-antibody reaction. Thus in a normal animal, antibody, if it exists at all, is present only in very small amount. A single dose of antigen, producing first a negative phase, subsequently calls forth a larger amount of antibody than in the untreated animal. These two processes explain the latent, or incubation period, during which no sensitisation is found. At the end of that period antibody is present in such amount that a second injection of antigen is almost at once subjected to lysis with the production of anaphylatoxin as *in vitro;* but in cases where by repeated injections immunity has been conferred the lysis proceeds even more rapidly than above, with the result that the toxic stage of proteolysis is so rapidly passed and the non-toxic stage reached that there is never sufficient toxin in the blood at any one time to cause symptoms.

For the serum disease of man, also, it supplies a simple explanation. It has been observed by numerous workers in connexion with the production of precipitins that there may exist in the blood of an animal both antigen and specific antibody side by side at the same time without precipitation occurring. Applying this fact to the case of a rash, joint pains, &c., developing after a first injection in man, it is known that the antigen in the blood gradually diminishes, while about the eighth day antibody has developed in large quantity; it is, therefore, probable that now both are present together, and when certain favourable concentrations relative to each other are reached reaction will, of course, take place, and the serum disease is the result.

It has also been abundantly shown that antibodies steadily disappear from the blood of an immune animal, but the cells remain more sensitive, and so, when necessary, antibodies are again formed more readily than in non-immune animals. An individual, therefore, who has received one dose of antigen will, if left long enough, eventually lose all antibody, but a second injection will bring about their more rapid production, and again when suitable concentrations of antigen and antibody are reached reaction results, and the reaction occurs earlier than in the case of a first injection but later than in the case of a fully sensitised animal—i.e., the reaction is accelerated but not immediate. Thus it is seen that one only of all the theories put forward comes near to satisfying criticism. Whether it will continue satisfactory as more facts are brought to light, or whether it, too, in its turn will be found wanting and yield place to yet another, time alone can show. As present it may be accepted provisionally as the best that has been formed.

The theory of bacterial anaphylaxis is precisely similar but does not call for comment in this place.

Clinical Considerations.

In spite of the fact that man is less susceptible to anaphylaxis than some other animals the danger of this condition is not one to be treated lightly in administering sera prophylactically or therapeutically. Even though the condition be comparatively mild, no one who has seen a case would desire the experience, still less would he who has once experienced it desire to repeat the experiment. Much work has therefore been done with a view to providing a method by which a sensitised person may be desensitised—i.e., rendered anti-anaphylactic—and, secondly, to curing the condition once it is established. Obviously the former is the more important, and for this the first essential is to recognise when the individual is sensitive. As has been seen, this is at present impossible with any certainty, so until proof to the contrary is forthcoming it must be assumed that anyone who has received one or more injections more than 14 days previously is in this state.

No satisfactory theory has yet been found to explain the development of anti-anaphylaxis, and the methods of producing it are for the present entirely empirical. In the first place, then, it must be thoroughly appreciated that unlike the hypersensitive state the refractory is but transitory and the former sooner or later returns, though perhaps to a somewhat less degree. A massive first dose in many cases requires longer to produce hypersusceptibility than a smaller, but does not cause anti-anaphylaxis as was formerly thought. The administration of lecithin was also said to prevent anaphylaxis, but this has been denied by others. Again, some workers showed that anæsthetisation with ether produced it, but this, too, has been later denied, and it seems that its only action is to mask symptoms while it does not prevent death. So much doubt has been cast upon these methods that they cannot be relied upon and are of no practical value in the treatment of man. The following, on the contrary, are not open to this objection and rest upon a firmer basis of experimental proof. The first of these is starvation, as pointed out by Lesné and Dreyfus. Hypersensitive animals deprived of all food and allowed only water for four to five days are at the end of that period refractory to a second dose of antigen. While, however, the desired object is thus attained the procedure is obviously unsuitable for clinical application, more especially as other and quite as efficient methods are available.

Vaccination against anaphylaxis may be employed by the injection of small doses of antigen during the incubation period, but to be effective these must be given late in the period, about the seventh, eighth, or ninth day, and have no such protective action if administered early—i.e., about the third, fourth, or fifth day. Once the hypersensitive state is established no use can be made of this method.

If 5 to 10 c.c. of the antigen be given into the rectum, this having first been thoroughly cleaned out, the individual is rendered refractory from 10 to 12 hours later, and further subcutaneous injections may be carried out with impunity. The antigen is very slowly absorbed when given by this route, which is probably the reason for the subsequent desensitisation, it having also been found that if the antigen be administered subcutaneously in such a manner as to ensure an extremely slow entry—e.g., after the fashion of a subcutaneous saline infusion—very large amounts may be tolerated, which if given rapidly in the usual way would certainly cause death. Both these methods present certain drawbacks in that they are inconvenient and occupy a comparatively long time. Finally there are two methods similar in principle but differing slightly in detail by which anti-anaphylaxis may be certainly effected with but very little trouble. In considering the phenomena of hypersusceptibility it was seen that the effective toxogenic dose was very considerably greater than the sensitising—that there was a definite minimum below which the antigen failed to elicit anaphylactic shock. This fact is here made use of, for by the injection of such a subminimal dose the individual is thereafter rendered refractory for a time, during which further and even large doses may be safely given. In man sensitisation rarely if ever reaches such intensity as to cause reaction with 1 c.c. of blood serum, so that in the use of

diphtheria or tetanus antitoxin, if it be considered unsafe to inject a large dose at once, 0·5 to 1·0 c.c. may be used as a preliminary injection, followed five or six hours later by any further dose that may be considered necessary. Should even greater rapidity be desirable, such a preliminary dose may be followed in 5 or 10 minutes by a larger and every 5 minutes or so afterwards by steadily increasing amounts whereby in a very short time enormous doses may be given and without risk of anaphylactic shock. In the case of tetanus antitoxin where prophylactic doses are given these are practically all innocuous. The amount of serum actually employed varies from 3 to 5 c.c., according to the concentration of the sample. An interval of anything up to five weeks between two such doses will never give rise to symptoms. About the sixth week, however, hypersensitiveness may appear. These remarks do not, of course, refer to those patients who have received previous massive injections—e.g., for declared tetanus or who require subsequent massive injections for therapeutic purposes. In such circumstances every precaution must be taken as indicated above.

It is obvious that nothing can be done to guard against the reaction after a first injection, as the individual gives no indication of his increased sensitiveness.

If the foregoing facts be borne in mind and the proper steps taken to avoid anaphylactic shock, there should rarely be any call for the treatment of that condition. Should it arise, however, every effort must, of course, be made to afford immediate relief. In mild cases the attack may be over before treatment can be applied; if more severe the exhibition of certain drugs may prove of service: such are atropine, adrenalin, chloral hydrate, and pure oxygen. In using either of the first two substances, subcutaneous injection is far too slow a method to be of use; they must be given intramuscularly or intravenously. In cases of still greater severity artificial respiration may be necessary and may alone succeed in tiding the patient over the period of shock, but is better used in association with one or other of the above-mentioned drugs. In a few instances of the utmost gravity no efforts will be of any avail, and death ensues. As regards the local signs, treatment is rarely called for. Much pain and swelling find relief in a hot fomentation, while irritation is allayed by moistening the surface of the part with 1 in 60 solution of carbolic acid.

Summary.

In conclusion it may be stated: (1) that man, like other animals, is liable to become anaphylactic; (2) that no certain indications of the existence of the state in him are yet available; (3) that there are certain methods by which the danger may be simply and altogether avoided; (4) that anaphylactic shock in man is very rarely of great severity; (5) that it can almost always be cut short and the patient restored by suitable therapeutic measures; and (6) that fear of this condition can never justify failure to employ antitoxic sera both prophylactically and therapeutically in those cases where it is indicated.

TRAUMATIC RUPTURE OF THE JEJUNUM; OPERATION; RECOVERY.

BY W. SAMPSON HANDLEY, M.S. LOND., F.R.C.S. ENG.,
SURGEON TO THE MIDDLESEX HOSPITAL.

THE following case of traumatic rupture of the jejunum has points of interest in addition to its fortunate issue.

Miss ——, aged about 25, while crossing a street, was knocked down by a motor 'bus, and one of the front wheels was said to have passed right over her abdomen. The patient herself could not remember anything of the accident. She was admitted to the Middlesex Hospital immediately in a state of profound shock. One or two fractured ribs were present on the left side, apparently the eighth and ninth. There was no visible bruising of the abdomen. The patient was rather pale, but not bloodless, the pulse slow, about 70, and very small, and the extremities rather cold. Her facial appearance was that of intense pain. The abdomen was absolutely and uniformly rigid all over. There were no areas of dullness, no loss of liver resonance, and the only localising sign was the fracture of the ribs. It was evident that some serious internal injury was present, most probably a rupture of the spleen, and immediate operation was undertaken. An incision was made in the left semilunar line. Owing to the difficulties presented by a long thorax this was subsequently extended obliquely upwards and inwards across the rectus muscle and then upwards in the middle line to the ensiform cartilage, thus assuming a bayonet shape. On opening the abdomen a certain amount of fluid came out, but there was no large amount of hæmorrhage. No gas escaped, but there was a little fluid which suggested intestinal contents. The spleen was exposed with much difficulty, since it was small in size and situated high up in the arch of the diaphragm. There was some bleeding from its pedicle, but the large vessels were evidently uninjured. The small intestine was now investigated, beginning at the duodeno-jejunal flexure. Almost immediately, at a point six inches below this flexure, the small intestine was found to be torn completely across. The tear was a fairly clean one, not extending beyond the intestinal edge of the mesentery, and hæmorrhage had ceased.

My first intention was to resect the bowel, but upon consideration there seemed no reason for subjecting the patient to this additional shock. I decided simply to join the bowel by making an end-to-end anastomosis; this was quickly done. A piece of gauze was packed down to the bleeding area near the spleen, and the incision was closed after washing out the abdomen in every part with a large quantity of saline and introducing a pelvic drainage-tube just above the pubes. A considerable quantity of intestinal contents was found to be present in the pelvis, and but for the lavage and drainage the patient would probably have had subsequent peritonitis and intestinal obstruction. At the end of the operation, which occupied about half an hour, the pulse was about 120.

The after-treatment included starvation diet for some days. During this period nutrition was maintained by two subcutaneous injections of normal horse serum. The day after the operation the patient vomited several times; no flatus had been passed and there seemed to be threatened intestinal obstruction. These symptoms, however, passed off upon the administration of eserine in doses of 1/40th of a grain subcutaneously three times a day. The eserine was supplemented by the use of injections of pituitary extract. From the fourth day the patient's condition gave rise to no anxiety, and she made a complete and rapid recovery. Solid food was first permitted about a fortnight after the operation.

I believe the favourable result of the case is largely to be attributed to my abstention from resection. The patient was in a state of deep shock, and it seemed very probable that the resection would have proved too much for her powers of resistance. It seems likely that the wheel of the 'bus did not pass completely over the abdomen, but that it crushed in the left side of the chest, and was arrested in the neighbourhood of the vertebral column. In its course it must have stretched and pressed backwards into the left kidney pouch the highest portion of the jejunum. Thus the transverse tear across the bowel was prouuced by tension and not by crushing. This, at any rate, was the conclusion at which I arrived.

A similar successful case of traumatic rupture of the jejunum near the duodeno-jejunal flexure was recorded by Mr. R. P. Rowlands.[1] In Mr. Rowlands's case there was a very large laceration 2½ inches long running obliquely across the dilated œdematous jejunum about a foot below the duodeno-jejunal flexure. The lacerated bowel was lying far back in the left flank near the spleen. The tear was closed by a two-layer continuous suture. The mesenteric border of the bowel had not been divided.

Berry and Giuseppi[2] found the mortality of rupture of the intestine from contusion in the records of ten London hospitals previous to 1908 to be 80 per cent. (67 deaths in 84 cases) Siegel's statistics, quoted by Rowlands, emphasise the importance of early operation.

Cases operated upon in first—	Mortality.
4 hours	15·2 per cent.
5-8 ,, ...	44·4 ,,
9-12 ,, ...	63·6 ,,
Later	70 ,,

The main interest of my own case is, I think, that it shows the possibility, and suggests the advisability, of avoiding resection even when the bowel has been completely torn across.

[1] THE LANCET, Feb. 26th, 1916, p. 459.
[2] Transactions of the Medical Society of London, 1908.

SOUTH AFRICAN PHARMACEUTICAL DIPLOMA.—Mrs. Lily Heymann, of Johannesburg, has passed the examination entitling her to practise as a chemist and druggist in the Transvaal, and is stated to be the first lady in South Africa to pass this local qualifying examination.

Reviews and Notices of Books.

An Introduction to Neurology.

By C. JUDSON HERRICK, Professor of Neurology in the University of Chicago. Illustrated. London and Philadelphia: W. B. Saunders Company. 1916. Pp. 360. Price 7*s.* 6*d.* net.

WHEN any branch of science has developed sufficiently to justify the appearance of a 350-page closely printed volume as a mere "introduction" to the subject, it may fairly be regarded as a subject whose field is wide and widening, and whose study is difficult and calls for application. The author's remark that neurology is a science whose study is intrinsically difficult if the student is to advance beyond superficial phases is not only the bare truth, it also explains the importance of grasping fundamental principles of nervous structure and function as a preliminary essential to their application in any of the subdivisions of science—medicine, psychology, sociology, education—where knowledge of the nervous system in man is required.

Professor Herrick's book comprises a series of chapters on (1) the structural elements of the nervous system and the phenomena of nervous activity; (2) the special anatomy of the various functional systems, such as those of the spinal cord, medulla, cerebellum, vestibular apparatus, auditory apparatus, visual apparatus, visceral apparatus, and so on, and the physiology of the same; and (3) the structure and functions of the cerebral cortex. Each of the chapters concludes with a summary of its contents and with a short bibliography of the more important papers bearing on its subject. In addition, there is a full index and glossary at the end of the volume. The illustrations are clear and accurate.

A book like this requires to be studied. It is full of information, both anatomical and physiological, and its instructiveness is enhanced both by frequent reference to clinical data and by the use that is made of comparative anatomy and, to a less extent, comparative physiology. The author is more content to state various hypotheses that hold the field in regard to any particular neurological problem than to adjudicate between them. The paragraphs devoted to the sympathetic system do not appear to give as clear a view of its physiology as might be desired, and there is little attempt to elaborate the niceties of cerebellar function. It is easy, however, to suggest additions when the subject is so large, while the author expressly eschews details in his desire to formulate general principles. On the whole the book is stronger on the anatomical than on the physiological side. Its merits are many, and it will be found to provide the student and the physician with an excellent summary of modern teaching, as based on recent research into the anatomy and physiology of the most complex system of the human body.

A Practical Guide to X Rays, Electro-therapeutics, and Radium Therapy.

By A. E. WALTER, M.R.C.S., L.R.C.P. Lond., Major, Indian Medical Service, &c. Calcutta: Thacker, Spink, and Co. 1916. Pp. 234. Price 10*s.* 6*d.* net.

IN writing this book the author has attempted to cover the whole field as stated in the title and to deal also with elementary electricity and the use and management of machinery for the production of electric power. He has included descriptions of nearly every known X ray apparatus as well as those used in electro-therapeutics. It is evident that we cannot look for any extended dissertation on any one subject, seeing that the whole is comprised in a volume of moderate dimensions. Under ordinary circumstances it would be a fair criticism that the author has attempted too much within the space he has allowed himself, but we have to remember that this book is mainly intended for those whose duty carries them to the outposts of Empire where information and appliances are not easily obtained, and where at times both ingenuity and resource are tested to the utmost. Looked at in this light the book fulfils its function well, and it will be of the utmost service to those for whom it has been written. Major Walter has the art of giving information clearly, and with a degree of conciseness that is seldom found, and for this reason it is a book that the beginner, at least, cannot afford to read hurriedly, so closely are the facts packed together. It may be said that when the contents of this volume have been mastered the student will have gained a very fair all-round knowledge of X rays and electricity in their medical applications, and will be in a position not only to do good work but to appreciate the writings of the more advanced workers.

Cleft Palate and Hare Lip.

By Sir W. ARBUTHNOT LANE, Bart., M.S. Lond., F.R.C.S. Eng., Surgeon to Guy's Hospital and to the Hospital for Sick Children, Great Ormond-street. Third edition. London: Adlard and Son. 1916. Pp. 102. Price 10*s.*

To this edition of his short but well-known work the author has made some additions, and especially he gives now an account of those measures which are requisite in many cases to render the condition of the patient as normal as possible after operation. The operation for cleft palate devised by the late Mr. Davies-Colley and now used extensively throughout the surgical profession was largely made known by Sir Arbuthnot Lane. The case for this operation is well put forward, but the relative merits of this and the Langenbeck operation are not discussed. Numerous excellent diagrams explain very clearly the operative procedures. A chapter on the speech training after palate operations has been contributed by Mr. Cortlandt MacMahon; this contains an account of the methods which should be adopted to remedy the remaining defects. The dental treatment of cleft palate is described by Mr. W. Warwick James, and an account is given of the prosthetic appliances which may be required.

Roentgenographic Diagnosis of Dental Infection in Systemic Diseases.

By SINCLAIR TOUSEY, A.M., M.D. Illustrated. New York: Paul B. Hoeber. Pp. 75. Price $1.50.

THE aim of the author is to show that teeth which may appear clinically healthy are frequently the foci of infection, and he points out that these foci can only be reliably diagnosed by means of the X rays. The book is well illustrated with skiagrams of the teeth obtained by means of films. Skiagrams obtained in the ordinary way on plates are frequently quite useless as a means of diagnosis, the film being the only reliable method, and the author has done good service by showing the value of this method in X raying the teeth. For the treatment of pyorrhœa alveolaris he advocates the use of X rays and high-frequency currents, but the cases he gives are not convincing. He shows skiagrams of the dental condition in a long series of diseases, and from his text we are led to infer that he considers the dental condition as the cause; but because two conditions are associated they are not necessarily related as cause and effect. The main value of the book is in the illustrations.

RECENT BOOKS ON CHEMISTRY.

A System of Physical Chemistry. By WILLIAM C. MCC. LEWIS, M.A. R.U.I., D.Sc. Liverp. With diagrams. London: Longmans, Green, and Co. 1916. In two volumes. Vol. I., pp. 523; Vol. II., pp. 552. Price 9*s.* each volume.—These two volumes serve to illustrate the important advances in our learning which have been made during recent years as the result of the joint study of chemistry and physics. The author has given his subject a very comprehensive handling and has included in his review some of the most recent theories and their adaptations, while his references to literature are copious and valuable. Indeed, this systematic work is by no means elementary in aim and scope, and the reader is advised to familiarise himself with the broad outlines of the subject before taking up the later problems. In any case he will not read the book profitably without some knowledge of both physics and chemistry, and he will require a mathematical faculty. The book is a valuable addition to the library.

A Text-book of Organic Chemistry for Students of Medicine and Biology. By E. V. MCCOLLUM, Ph.D. New York: The Macmillan Company. 1916. Pp. 426. Price 10*s.* net.—The author expresses the hope that this book will "serve as a satisfactory text for students of medicine and others who can give but a semester to this subject, and whose interest

is in some field of biology." This is a frank acknowledgment of the limitations of the book, but it is undoubtedly useful to have a compilation more or less confined to the description of those organic compounds which are concerned in biological processes. These compounds form a large group, and so considerable ground in organic chemistry is covered. The author very properly emphasises the importance of structure and constitution, and altogether presents his subject logically. The book is a valuable preparation for the intelligent consideration of physiological questions.

A Method for the Identification of Pure Organic Compounds. Vol. II. By SAMUEL PARSONS MULLIKEN, Ph.D. London: Chapman and Hall, Limited; New York: John Wiley and Sons, Inc. 1916. Pp. 327. Price 21*s.* net.—We reviewed at some length in THE LANCET of June 18th, 1904, the first volume of this series, which embodied the classified descriptions of about 2300 of the more important compounds of carbon with hydrogen and with hydrogen and oxygen. This second volume is no less thorough in its breadth of treatment, containing classified descriptions of about 4000 of the more important compounds of carbon with the elements nitrogen, hydrogen, and oxygen. The former volume thus deals with aldehydes, carbohydrates, acids, phenol derivatives, esters, ketones, alcohols, and hydrocarbons, while the present volume relates to organic bases, alkaloids, amino-bodies, nitro-groups, and so forth. It provides a systematic analytical procedure based on physical properties and chemical reaction, and amounts to a dictionary of physical constants and chemical characteristics or tests of the compounds coming under the order set out by the author. This compilation must have entailed an enormous amount of work, including the careful verification and revision of the proofs, and it has all been admirably done. It is hardly necessary to point out what a valuable work of reference this will prove to be to a very large section of scientific investigators.

Organic Chemistry. By VICTOR VON RICHTER. Vol. I., Chemistry of the Aliphatic Series. Newly translated and revised from the German edition (after Professor Edgar F. Smith's third American edition) by PERCY E. SPIELMANN, Ph.D., B.Sc., F.I.C., A.R.C.Sc. London: Kegan Paul, Trench, Trübner, and Co., Limited. 1915. Pp. 720. Price 21*s.* net.—The publishers explain that a year's delay has occurred in the production of this volume owing to Dr. Spielmann's employment on important work connected with explosives for the Government. This is the first time, we believe, that the German original has been directly translated in this country, previous translations into English having been done by an American author, Edgar F. Smith, professor of chemistry in the University of Pennsylvania. The present volume is a translation of the latest edition of the German original. The references to German literature (largely the "Berichte der deutschen chemischen Gesellschaft" and Liebig's "Annalen der Chemie") are very copious, but tell us only the number of the journals without giving their dates. It is thus difficult to see at once whether these references are recent, although a general inspection of the subject-matter shows that the book has been brought well up to date. The index is very complete, amounting to 40 pages in close small type, thus showing a considerable extension on previous editions. Within its compass there is no work that we know of which gives such an exhaustive list of carbon compounds, and while the descriptions are necessarily brief it is not easy to find omissions. The reader requiring fuller information has references provided. The following paragraph (page 576) on the C-alkylated barbituric acids has evidently been overlooked in the reading of the proof-sheets: "These compounds have been minutely studied on account of some of their number acting as *valuble saporifics*—e.g., C-diethyl barbituric acid (veronal) and C-dipropyl barbituric acid."

Analytical Chemistry. Based on the German text of F. P. TREADWELL, Ph.D. Translated and revised by WILLIAM T. HALL, S.B. Vol. I.: Qualitative Analysis. Fourth English, after the eighth German, edition. New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Limited. 1916. Pp. 538. Price 12*s.* 6*d.* net.—This book well illustrates the application of new principles to the interactions concerned in analytical chemistry. The theoretical side of the subject, that is to say, has been developed, and so we find the mass action principle discussed, the ionisation theory, and the theory of oxidation and reduction. The reactions throughout are expressed in equations with the ion signs, and when reversible the sign of the double arrow $\rightleftharpoons$ is used in place of the equality sign =. The materials of the book are well chosen and the descriptions are up to date, while the selection of tests is clearly based on a practical acquaintance with satisfactory procedure. There is an obvious knowledge of the fallacies which creep into analytical literature. While the author introduces much that is novel, he adopts improvements on the well-known classical tests, bringing them into a line with new facilities and improved reagents. As an example of a refinement in the work of chemical detection may be mentioned the exquisite test for the presence of mercury vapour in the air. This test is said to be so extremely sensitive that a blank test performed in places where work with mercury has been performed will often show the presence of this element in the atmosphere. It depends upon the absorption of mercury by gold-leaf placed in a tube through which the air is aspirated. The leaf is then placed in an exhausted tube previously washed out with hydrogen. An electric discharge is next passed through the tube, and the characteristic green line in the spectrum is distinctly visible in the presence of the merest trace of mercury. The test is still more sensitive when the gold-leaf is warmed.

JOURNALS.

Journal of Physiology. Edited by J. N. LANGLEY, Sc.D., F.R.S. Cambridge University Press. 1916. Vol. L., No. 5, pp. 265–344, price 6*s.*; No. 6, pp. 345–390, price 3*s.*; No. 7, pp. 391–458, price 5*s.*—On Anaphylactic Effects as shown in Perfusion Experiments on the Excised Heart, by A. S. Leyton, H. G. Leyton, and S. C. M. Sowton. Alien serum was perfused through excised hearts, the muscle of which had been sensitised by a previous injection of a small dose of an alien serum. The results do not lend themselves to summary.—Variations in the Blood Sugar in Health, by George Graham. The sugar was investigated by a modification of Bang's method in the author's blood at intervals for over one year, and it was found to vary between 0·1 and 0·13 per cent. The ingestion of 100 gm. of glucose produced a sudden rise in the blood sugar, apparent 10 minutes later and usually reaching its maximum in 20 minutes, and falling to its original level in one to one and a half hours. Under conditions which cause fatigue the blood sugar rose to a greater height and took three to four hours to fall to its original level. The author suggests that in the normal rise the "extra" sugar is on its way to the muscles and other storehouses, and that the rise which takes place in fatigue is due to slight failure of the muscles and other storehouses.—The Regulation of Excretion of Water by the Kidneys, by J. S. Haldane and J. G. Priestley. The authors find that the enormous diuresis caused by ingestion of water is not dependent on general dilution of the blood with liquid and that the diminished excretion of urine following great sweating is not dependent on the general concentration of the blood, although some general concentration may occur. —The Biological Mechanism of Growth, by W. Cramer. The author continues his researches on growth as manifested in transplantation of neoplasms.—Observations on Denervated Muscle, by J. N. Langley. The atrophy of denervated muscle is shown to be not merely a disuse atrophy due to the absence of contraction.—The Recovery of Conductivity and of Excitability in Nerve, by E. D. Adrian. The experiments show that the recovery of conductivity is probably complete at the moment when recovery of excitability is complete.—The Function of Hæmoglobin in Invertebrates, with Special Reference to Planorbis and Chironomus Larvæ, by I. Leitch. The author finds that in these larvæ. the function of hæmoglobin consists in making available, by its power of binding oxygen chemically, a quantity of oxygen sufficient for the needs of the animals at oxygen tension so low that the necessary amount is not supplied by physical solution. The experiments were conducted

under the direction of Professor Krogh in Copenhagen.—The Effects on Higher Animals of the Sterilisation of the Inhabited Medium, the Air and the Food, by I. Kianizin. Much difference of opinion prevails as to the effect of micro-organisms on higher animal life. The author has been engaged investigating this subject at intervals from 1894. He gives a summary of other workers in the same or similar fields. Observations—micro-organisms being excluded, sometimes from the air or food, or both—have been made by many other observers on guinea-pigs, tadpoles, and chickens obtained from sterilised eggs. Some of the observers found that the absence or partial absence of micro-organisms has a deleterious effect on nutrition. From his own observations on mammals of the effect on the assimilation and dissimilation of nitrogen, on sterilising the air and food supplied to them, the author found that there was a decrease of nitrogen assimilation and that death soon followed, varying in different animals. The more fatal results in his observations the author attributes to a more complete absence of micro-organisms in the air, and concludes that the micro-organisms of air are essential to life. Not only is there an imperfect assimilation of N compounds, but there is a large increase of leucomaines.—Slow Waves of Contraction in Muscle, by J. N. Langley. As long ago as 1858 Schiff observed that on mechanical stimulation of mammalian muscle a short time after death a slow wave of contraction proceeded from each side of the point struck, and on arriving at the end of the muscle was reflected backward. In the meantime another wave had been set up at the stimulated spot and crossed the reflected wave, which was in its turn reflected. Since then it has been found that slow waves of contraction occur in normal muscle. It has been suggested that the contraction is a sarcoplastic and not a fibrillar contraction. So far it does not appear that such waves due to chemical stimulation have been described. The author has made observations especially upon the effects of sodium sulphocyanide, which produces waves with considerable constancy. They can be set up in the nerve-free ends of the sartorius of the frog as well as in the middle region, and they are not prevented by curarisation. The ease with which they can be set up by direct application of 2 per cent. sodium sulphocyanide in Ringer's fluid varies with different muscles. They are readily obtained in the leg muscles. Other drugs, such as eserine salicylate, were also used.—The Action of Sodium Sulphocyanide on Muscle, by J. N. Langley. The author confirms in general the observation that sodium sulphocyanide (2 per cent.) applied to a frog's gastrocnemius muscle causes strong primary contraction, followed by contracture and by frequent twitchings. The effects, however, vary with the condition of the muscle itself and also with individual muscles. Some of the effects are prevented by curari, others not. The action of the drug in some respects resembles that of guanidine, and in others that of nicotine. Guanidine, when applied to a small spot of a muscle, often causes twitching, not only where it is applied, but at some part of the muscle more or less remote from this, best in submaxillary and gracilis. Reasons are given for thinking that this outspread of contraction is due to axon reflexes, and not to fluid—The Influence of the Vagus on Pancreatic Secretion (No. 2), by G. V. Anrep. This is a supplement to a previous paper,[1] already referred to in THE LANCET. In a decerebrate dog stimulation of the peripheral end of the vagus at first is generally without effect on the pancreatic secretion; but there follows after a long latent period a secretion which reaches its maximum only after the end of stimulation. With repetition of the stimulation the flow of juice may start within a few seconds after stimulation is begun. The gland would seem to be in a state of inhibition during the long latent period—all secretory action of the pancreas is blocked, the secretory capacity of the gland is diminished. The vagus exerts the same inhibitory action on a secretion obtained by injecting HCl into the duodenum, or secretin into the veins. The author finds that:—1. Stimulation of the splanchnics or obstruction of the aorta causes a diminution of the pancreatic secretion—the former may even cause complete arrest. If the secretion is rapid, the strongest stimulation of the splanchnic nerve causes only a slowing, never an arrest. Aortic compression is more effective, and it finally stops the secretion in every case. 2. The vagus has no vaso-constrictor- nor vaso-dilator fibres to the pancreas. 3. Stimulation of the vagus causes a dilatation of the pancreas; when secretion begins the dilatation finishes, and the gland comes to its normal volume. 4. The dilatation is abolished by atropine when secretion is abolished. 5. Vagal "inhibition" of the pancreatic secretion is accompanied by a dilatation of the gland strictly coinciding with the time of this inhibition. 6. The dilatation is the result of a constriction of the pancreatic ducts or of a retention of the juice in the glandular cells which secrete it.—The Direct and Indirect Effects of X rays on the Thymus Gland and Reproductive Organs of White Rats, by Evelyn E. Hewer. As both thymus and reproductive organs are affected by X rays it was expected that irradiation of one organ might bring some light to the question of its relation to the other organ. We can only quote a few of the author's results. Direct irradiation of the thymus does not determine the appearance of Hassall's corpuscles unless the gonads are simultaneously treated. Irradiation of the thymus only causes slight degeneration of the male gonads and delay of sexual maturity, but no alteration in the female. As to irradiation of the male gonads, degeneration occurs and the affected cells are set free in the lumen of the tubules by desquamation. Regeneration is possible, depending on the age of the animal and the total dose of X rays. If the spermatogonia are all destroyed no regeneration can occur. Hassall's corpuscles always appear, but disappear in time. Excessive vascularisation of the suprarenal and hypertrophy of the islands of Langerhans sometimes occurs. A very weak total dose accelerates sexual development. Irradiation of female gonads shows that young ova are more resistant than older, while the corpora lutea become abnormally vascular and the hypertrophy of the interstitial gland is constant and persists even after apparent regeneration of the ovary.

[1] Jour. of Phys., xlix., 1915.

Journal of Cancer Research. Baltimore: Williams and Wilkins Company. Price 23*s.* per annum.—In the last issue of this quarterly magazine, dated October, 1916, but not published till quite recently, Professor G. N. Calkins continues his studies of the effects of cancer tissue, embryonic tissue, and normal tissue on the vitality of protozoa, using *Didynium nasutum* again as indicator.—Dr. L. Loeb and Dr. M. S. Fleisher describe in great detail transplantations of benign tumours of the rat, mostly adeno-fibromata.—The number includes an account of a case of primary carcinoma of the ureter, by Dr. E. C. Schmidt, in which the 19 cases previously recorded in the literature are analysed. The contribution to the question of cancer heredity by Miss M. Slye, entitled "The Inheritability of Spontaneous Tumours of Specific Organs and of Specific Types in Mice," is important. Miss Slye concludes that the predisposition to develop cancer of certain organs is inheritable. Genealogical trees are given of a number of strains in which cancer of the lungs or liver, for example, occurs with abnormal frequency. It is rather disconcerting, however, to find that in the cases of the lung and the liver metastatic tumours are grouped with primary growth in calculating the percentage frequency of deaths from cancer in these strains. Even without the metastatic growths the tendency to aggregation of primary cancer of specific organs in single strains is evident, but naturally not to the same extent.

ROYAL COLLEGE OF SURGEONS OF ENGLAND.—A quarterly meeting of the Council was held on Jan. 11th, Sir William Watson Cheyne, the President, being in the chair. The best thanks of the Council were given to Dr. W. Colin Mackenzie, of Melbourne, Australia, for presenting to the College his collection of marsupial and monotreme material used by him for the purpose of an investigation, carried out in the Museum workrooms, relating to the anatomy and physiology of the animals which are native to Australia. In reply to a letter from the War Office the Council stated the arrangements which they considered might be made for placing on exhibition a selection of pathological specimens from military sources of which the College are taking care for the War Office. New by-laws were ordained for giving Fellows resident abroad facilities for voting for members of Council, and steps are about to be taken to submit them to the Crown for approval. Mr. F. F. Burghard was appointed a member of the Committee of Reference

THE LANCET.

LONDON: SATURDAY, JANUARY 20, 1917.

Mobilisation of the Medical Profession.

FROM previous articles which have appeared in these columns it is well known to our readers that a very important and critical point has been reached in the position of the medical profession with regard to the supply of doctors for the Navy and Army, principally, of course, with regard to the supply for the latter service. The methods under discussion to arrive at a satisfactory scheme have been alluded to by the medical correspondent of the *Times*. While everyone knows that debates of an important character have been taking place in regard to the mobilisation of doctors, to-day we are able to announce that representatives of the Central Medical War Committee, of the Committee of Reference of the English Royal Colleges of Physicians and Surgeons, and of the Scottish Medical Service Emergency Committee are seeking an early interview with the Director of Public Services, having submitted a memorandum on the many problems involved.

The main question at issue is whether the medical profession should or should not mobilise itself as a separate entity under the Director of National Service, this being an immediate response to the statement of the Prime Minister, who, when speaking of the whole population, intimated that, where voluntary mobilisation did not fulfil expectations, compulsory powers would have to be sought. Put quite crudely, Mr. LLOYD GEORGE'S intimation was that, speaking of the community at large, where volunteer services were found to be inadequate, general conscription would be employed, so as to ensure that every man in the country, during the critical position in which the State is now placed, should give his help how, when, and where he is best qualified to do so. For it is common knowledge that at the present moment there is not only a large number of people who are shirking their responsibilities, but that there is a still larger number whose potentialities for good are not properly utilised, and who may be doing, as well as they can, things for which they are unfitted, while activities for which they have real qualifications are neglected or remain in other hands. We must all feel that, as far as the medical profession is concerned, we want to be free from such reproach, for economy of labour is necessary for our national welfare. The country is absolutely sound in its resolve to proceed to the unquestioned and commanding success which, though so long delayed, has become inevitable by the trend of naval and military affairs. This resolve is quite general and unfaltering, but the measure of delay in the accomplishment of our great aims is the measure of the widespread trouble in which we all abide, as well as of the incalculable misery to those who are under the heel of the invader. The shortest possible term must be put to this position, and while the one and only argument that will prevail is the possession by our cause of incomparable fighting forces, the duty before all sections of the population is to keep those forces at a standard of perfection. When the medical profession is told that doctors are and will be required for the army, we medical men know that in some way or other they must be found.

The medical profession is the one section of the community which is already equipped for its work. The duty of a medical man in times of war, as in times of peace, is primarily to prevent disease or injury and, secondarily, to remedy disease or injury. It is not a question of the dyer making explosives, of the bicycle or the piano manufactory being employed for the manufacture of war material, of the governess becoming a milkmaid, or of the judge becoming a chemist. The doctor who practised before the war is ready-made in all essentials to be the doctor during the war, but if a full value is to be got out of his specialised services, and if the limited supply of personnel is to meet a practically unlimited demand, the greatest possible economy must be exercised. Square pegs must be put into square holes, and overlapping must be guarded against. Moreover, offers of part-time assistance must not be despised as partial patriotism; and especially must this view be discountenanced where it can be proved that, not only would the part-time service enable others to offer whole-time service, but that the rest of the time of the partly employed doctor with the troops could be utilised for the good of the State in a civilian capacity. To our mind all this means one thing only—it means that any organisation of the medical profession to meet the emergencies of the situation should be carried out under the assistance and guidance of members of that profession. They are familiar with the possibilities and limitations of medicine and with the characteristics of the help that can be offered by individual medical practitioners; they are also aware of the amount of work which must be discharged by medical men to keep the civilian population in health. We are all in this war—man, woman, and child; that is what the Prime Minister meant in his reference to the determination to seek compulsory powers with regard to the whole of the community if voluntary mobilisation failed. But by as much as we are all in this war, by so much is it necessary that the health of us all should be maintained, so that our general efficiency for attack or resistance should remain at the high level that can be only expected from a physically sound people. If the medical profession is mobilised as a separate entity under the Director of National Service, but in accordance with its own experience and knowledge, the three statutory committees now existing—namely, the Central Medical War Committee, the Committee of

Reference of the English Royal Colleges, and the Scottish Medical Service Emergency Committee—would form the organisation necessary to carry out the work, allowing for modifications which it would not be difficult to bring about. The task before these Committees, however strengthened, must be difficult, but they possess the information and experience. More doctors are required for the Army, and at the same time the number of men discharged as disabled grows, and the medical care of the munition workers increases in urgency. The number of doctors of military age who can possibly be spared from their districts is now becoming small. These facts indicate that there must not be delay in meeting the situation by a definite line of action.

Tetanus and the Use of Protective Serum.

TETANUS is no longer a frequent complication of gunshot wounds, but it is still, when it occurs, so likely to be fatal and so horribly painful to the patient that no efforts can be too great to get rid of the disease altogether. In the home military hospitals during the year ending July 31st, 1916, we know from Sir DAVID BRUCE'S analysis which we published on Dec. 2nd last, that 195 cases of tetanus were received, of which 96 died. The number received varied greatly from month to month, roughly in proportion to the total number of gunshot wounds. No obvious falling off occurred during the year, and there is at the present moment some evidence to hand of an increasing number of cases, some of them being of the fulminant variety so tragically common in the ranks of all the combatants during the early months of the war.

As a prophylactic injection of protective serum is now a routine measure at the front in every case of gunshot wound, it is evident that the protection afforded by a single injection is not complete. The official Memorandum on Tetanus[1] advised the repetition of the serum injection in all septic cases at intervals of seven days in order to keep up the protection, but Sir DAVID BRUCE commented in his analysis on the fact that there was no record of the employment of serum as a prophylactic in the home military hospitals. Possibly the fear of harmful effects from repeated injections of horse serum may have acted as a deterrent, for "serum disease," as it may still conveniently be called, may be a very serious matter when it occurs—witness the rapid death from anaphylactic shock of animals injected with foreign protein appropriately dosed and spaced. It is well, therefore, to recall the statement in the Memorandum that the danger of anaphylactic shock is negligible when the prophylactic dose is contained in such a small quantity as 3 c.c. of horse serum, whatever the interval after the preceding injections. Highly concentrated serum in doses sufficient to maintain protection may be repeated at weekly intervals as long as is considered advisable without any fear of the occurrence of anaphylaxis.

[1] THE LANCET, Nov. 18th, 1916, p. 873.

So much for prophylaxis. The case is somewhat different in regard to the massive doses demanded in curative treatment after symptoms of toxæmia have already shown themselves. The large doses of horse protein which necessarily accompany the requisite number of antitoxic units may be a source of inconvenience or danger. The paper by Captain S. WYARD, R.A.M.C., which we print this week, sets out clearly and simply how these inconveniences can be entirely avoided. A small rectal injection of antigen within 12 hours renders the individual refractory to a subcutaneous dose of any size, or if this amount of delay is held inadvisable the same result can be obtained by a succession of subcutaneous doses, beginning with a very small dose and rapidly rising to a large and efficient one. Observance of these precautions should be sufficient to remove all risks of anaphylaxis, and the fear of its occurrence can no longer justify the failure to employ protective serum in every case where it can possibly be of service.

Annotations.

"Ne quid nimis."

NEW FOOD ORDERS.

THE new Orders issued by the Food Controller last week will disturb still further part of the customary dietary of most of us. An increased economy of wheat material is suggested, and instead of 76 per cent. now extracted from the grain, a further 5 per cent., making a total of 81 per cent., is insisted upon. The Order is probably based upon the fact that the public have found the new bread acceptable, and, that being so, a further extraction of 5 per cent. from the total grain will produce an equally acceptable loaf and effect a further important economy. For the first time, however, an option is given to the miller to mix with the wheat flour derived from barley, maize, rice, or oats to the extent of 10 per cent. This means that the miller need not mill his wheat further than the original allowance of 76 per cent. if, as an alternative, he chooses to add a proportion of other flours. We made a similar suggestion to this in a leading article in THE LANCET of Jan. 30th, 1915, when we said it would be possible to add to rich gluten flours a proportion of starch, as, for example, maize flour (cornflour), without materially reducing the nitrogen value when compared with a low-grade wheat flour. The energy value of such a loaf would be quite high, while its nourishing properties would be little impaired. Maize flour or rice, however, would carry in little more food material than starch, while barley and oats would add proteins and fat, and from a dietetic point of view the loaf containing an addition of barley and oats would, likely enough, have a superior value to the loaf made with a similar proportion of maize or rice. To those who hold that bread is primarily eaten not as a source of protein, but as an easily digestible, attractive form of starch, it matters little which flour is employed. Obviously, however, the wheat substitutes can be used for no good purpose unless they are cheaper than wheat-flour itself. Apart from this question, there must be considered also the physical qualities of the loaf;

texture, for one thing, is an important property. It is not all cereals which will make a light, spongy bread, and wheaten flour is easily first in producing a loaf of uniform porosity which is an essential characteristic of a bread that is to be easily masticated and digestible. The lumpy, sodden loaf is unattractive besides being indigestible, and its food value may be largely discounted owing to its causing gastric difficulty. The new Order, we take it, exempts the baker from the old requirements of the Bread Act if he chooses to use other flours than wheat. According to this Act, a loaf of bread containing any other flour than wheat must be marked with a large capital letter M, and there is liability to a heavy penalty if this is neglected. The old controversy as to whether sugar is an essential in our dietary has been revived, and more than one well-known physiological authority has stated that sugar is not a natural food, inasmuch as the human economy is constructed to convert carbohydrate—e.g., starch, which they claim to be a natural foodstuff—into sugar. It is quite certain that if sugar were tasteless or not sweet it would not be so popular as it is, and so from this point of view it must rank as a condiment as well as a food. It is interesting to recall that sugar was scarcely a commercial commodity much more than a century ago, and in the time before that our ancestors got on very well without it, while, as a matter of fact, a big section of the community consumes nowadays very little or none of it. The history of starches in the dietary, however, goes back to the beginning of things, and there was always a supply of starches long before sugar was cultivated or thought of in its present form. Custom and cheapness have brought sugar into wide use, and we are glad to note that its employment in many extraneous and totally unnecessary ways is prohibited.

THE MORITZ-WEISS REACTION IN SURGICAL PRACTICE.

THE permanganate test was believed by its discoverer to have a special diagnostic and prognostic value in tuberculosis. Moritz-Weiss in 1911 affirmed that when the reaction was positive in the urine of persons suffering from tuberculosis the patient had little chance of recovery owing to the extension of the tuberculous process or to his small resistance to Koch's bacillus. It was further claimed that this test was superior to the diazo-reaction for several reasons: greater simplicity of technique, greater sensitiveness, and the lesser influence on it of substances given medicinally. The original technique is as follows. The urine for examination, which must be perfectly clear and not have undergone ammoniacal fermentation, is diluted with twice its volume of water. To a test-tube of this mixture three drops of a 1 per cent. aqueous solution of permanganate of potash are added and shaken. If the reaction is negative the liquid does not change colour or takes a faint violet brown tinge; if positive it becomes golden yellow. The reaction was said not to occur in normal urine, and was not produced by the ingestion of certain drugs, such as creosote and opium, which influence the diazo-reaction. Dr. Carlo Belgrano published in the Surgical Section of *Il Policlinico*, Sept. 15th, 1916, the results obtained by the systematic testing of the urine in 369 surgical patients, repeating the test at intervals so as to ascertain the behaviour of the reaction at various phases of the course of the disease. The cases included surgical tuberculosis, acute local and general inflammatory processes, gangrene, malignant tumours, and varicose ulcers. The conclusions arrived at from these experiments were to the effect that the Moritz-Weiss reaction was not specific for tuberculous disease, although it was more frequently present in diseases of this kind than in others, and that it occurred for the most part in the urine of individuals suffering from serious diseases which produce rapid cell disintegration—that is, in cases where high temperature was present associated with profuse suppuration. The reaction, according to Dr. Belgrano's observations, seemed devoid of any prognostic value, for though it almost always coincided with the phase of the greatest severity of the disease it did not necessarily indicate an unfavourable prognosis. Furthermore, the reaction disappeared and reappeared during the course of the disease, its disappearance coinciding, as a rule, with a period of improvement in the patient.

DOUBLE EMPYEMA SUCCESSFULLY OPERATED UPON.

CASES of operation for double empyema are rare. In the *Boston Medical and Surgical Journal* recently Dr. F. B. Lund and Dr. H. Morrison have reported the following case. A girl, aged 16, was attacked on March 30th, 1915, with epigastric pain, vomiting, headache, and slight cough. The temperature was 102° F., pulse 120, and respirations 30. There were signs of beginning consolidation at the base of the left lung. From the commencement the patient looked very ill. On April 1st her leucocyte count was only 5000. On April 2nd the right lower lobe was affected, and by the end of the ninth day the middle and lower lobes of the right lung and the lower lobe of the left were solid. The temperature ranged from 100°–101° mornings to 103°–104° evenings. There was slight cyanosis, with considerable dyspnœa, and the sputum was muco-purulent and very tenacious. The crisis failed to appear during the next six days. The patient was prostrated; she was running a septic temperature and was beginning to perspire freely. At both bases and the axillæ there developed "flatness" below the level of the angle of the scapula with distant bronchial breathing and bronchophony. Above this zone were fine crepitant râles. On April 14th she was sent to the Boston City Hospital, with the provisional diagnosis of double empyema. An X ray examination showed increased density in the left lower lobe, suggesting consolidation rather than fluid. Dr. Lund performed paracentesis in two places on each side of the chest with no result. On April 18th she began to cough up a great deal of foul pus, without relief. On April 21st the left chest was again tapped. This time a few drops of thick pus were obtained in the ninth interspace in the posterior axillary line. Resection of the ninth rib was done with the evacuation of several ounces of thick foul pus, similar to that which the patient was expectorating. Drainage was established through a rubber tube inserted obliquely, with the skin sutured over the end to act as a valve. On the following morning the patient's condition had not improved, and the right pleural cavity was explored a second time. A needle inserted through the tenth interspace near the spine, and directed upward, obtained a few drops of pus. The tenth rib was

resected near the vertebra, and a few ounces of foul pus were found between the right lung and the spine. Drainage was established through a rubber tube. The patient began to improve at once. There was profuse drainage through both tubes. The cough and expectoration gradually subsided. By the end of May both wounds were granulating, and there was very little discharge through the small sinuses. On May 29th an X ray examination showed no evidences of fluid in the chest; there was some haziness throughout both lungs, but they were well expanded. Complete recovery followed. Evidently the double empyema followed pneumonia. When the patient began to expectorate fœtid pus there must have been a perforation through the lung.

TRICHOMONAS DYSENTERY AT AREQUIPA.

FOR a long time cases of dysentery, some of them fatal, have been occurring at Arequipa, a town of about 35,000 inhabitants situated at the foot of the Peruvian Andes. Many of these cases were recognised to be of the amœbic form, but others occurred in less amount of the balantidial kind, and some of mixed forms: the prevailing type was that due to infection by *Trichomonas intestinalis*, a small protozoal parasite, which was found in abundance in the stools of the patients. Papers on this subject were published not long ago in the *Bulletin de la Société de Pathologie Exotique* (vol. vi., No. 2, and vol. vii., Nos. 8 and 9) by Dr. Edmundo Escomel, of Arequipa, who, in studying the protozoal organisms present in the potable water of that town, discovered *T. intestinalis* in the public service in adult forms and in the cystic stage. In particular, he found the organism in considerable amount in the distributing reservoir, which was inadequately protected against contamination from various sources. One of its feeders, for instance, was a small stream in which women from the town were accustomed to wash their body linen and other articles. Steps were at once taken by Dr. Escomel, who held the appointment of medical examiner of the public water-supply, to protect the water service from pollution, and particularly to guard the distributing reservoir from contamination. Since this was done trichomonas dysentery has entirely disappeared from Arequipa. It is of interest to mention that while this form of dysentery was prevalent Dr. Escomel found that no benefit followed the administration of ipecacuanha, but that considerable improvement resulted from giving the essence of terebinthine. Later, as a result of experiments *in vitro*, he found that the trichomonas organisms died as soon as they came in contact with a solution of iodine (1 in 1000). He, therefore, with success treated his later patients by enemas containing a dilute solution of iodine, and he claims for this method that, though simple, it is most efficacious in the majority of instances.

TWO SOUTH AFRICAN MEDICAL MEN.

A CORRESPONDENT in South Africa has called our attention to the many points in common presented by the widely differing careers of two medical men whose deaths have just occurred. Dr. Josiah Wright Matthews, an intimate friend of Cecil Rhodes, lost and made in speculation three fortunes, and died at Greytown, Natal, on Dec. 5th last, at the age of 76. Qualifying in 1864 as L.S.A. Lond., L.F.P.S. Glasg., he graduated later as M.D., C.M., at the University of Aberdeen in 1871. His public and professional life was spent in South Africa, where he commenced practice as district surgeon at Verulam. Subsequently he became one of the pioneers of the diamond fields at Kimberley, where he did much valuable work in hospital reform. On the annexation of Griqualand to the Cape he was elected Member of Parliament for Kimberley. In later years he was a prominent public man at Barberton. As a traveller he had many interesting reminiscences to record, and these were embodied in a book which he published some years ago under the Zulu title of "Incwadi Yama." Five days later Dr. William Russell, who for many years was resident surgeon at the Kimberley Hospital, died from pneumonia, after a protracted illness, at the comparatively early age of 48 years. Dr. Russell also qualified with honours as M.D. at Aberdeen University in 1896, after having obtained his M.B., C.M. in 1890 and his D.P.H. (Eng. Conj.). He was resident surgeon for several years at Toxteth Infirmary, Liverpool, and later was superintendent of hospitals at Maidstone during the typhoid epidemic there in 1897. He was the author of a clinical record of over 500 cases of typhus fever, and also wrote a thesis on accidental rash in typhus and typhoid fevers simulating the rash of scarlet fever. Going out to South Africa in 1898, 30 years later than Dr. Matthews, Dr. Russell served for a while in temporary appointments, and later became senior house surgeon of the Kimberley Hospital, and was very popular among all classes of the people of the diamond fields. He held this office with great credit during the time when the town was besieged by the Boers, and relinquished the post three years ago in order to enter upon private practice. His tireless devotion to duty during the siege was acknowledged in an autograph letter sent to him by direction of Queen Victoria and by another from Lord Roberts.

A WAR-TIME PATHOLOGICAL MUSEUM.

THE collection of specimens of pathological interest from military hospitals at the Royal College of Surgeons has now reached a stage at which a selection can usefully be made for immediate study. Major T. R. Elliott, who was placed in charge of the collection and transmission of the specimens from the laboratories of the base hospitals in France, has been successful in obtaining a total, so far, of over 1100, and these have been stored and indexed. Professor S. G. Shattock, with the help of the pathological assistant to the College, is going through the specimens with a view of making a representative selection, for which purpose Mr. Raymond Johnson has placed his experience at their disposal.

THE King has appointed Sir William Whitla to be one of His Majesty's honorary physicians in Ireland in the room of the late Dr. James Little.

CENTENARIANS.—Mrs. Sarah Brooks, an Essex centenarian, died recently in her 105th year, and Mr. John Froggatt has died at Offerton, Cheshire, aged 102 years and six months. He had 80 descendants, and 14 of his grandsons are serving in the Army.—Miss Bailey, of Esher, has received the congratulations of the King and the Duchess of Albany on the attainment of the 100th anniversary of her birthday.

THE LANCET, VOL. II., 1916: THE INDEX.

THE Index and Title-page to the volume of THE LANCET completed with the issue of Dec. 30th will be ready on Jan. 22nd. Owing to the continued shortage in the paper-supply, the Index will not be issued with all copies of THE LANCET, as was the custom prior to the War. Subscribers who bind up their numbers are requested to send a post-card to the Manager, THE LANCET Office, 423, Strand, London, W.C., when a copy of the Index and Title-page will be supplied free of charge.

THE CONTROL OF VENEREAL DISEASES.

The Midwife's Share in the Informal Notification of Syphilis.

A PASSAGE in the Liverpool scheme which we have already briefly summarised[1] calls attention to the systematic examination by the city bacteriologist of stillborn infants. Through the coöperation of the midwives Professor J. M. Beattie is now enabled to examine a large proportion of the infants born dead before term and, as Dr. E. W. Hope states in the report, has found that in a great majority of these syphilis was the cause of the stillbirth. The services of the midwife are then further utilised to induce the mother to attend at the bacteriological department for the examination of her blood by the Wassermann test. If this is found to be positive, a little further persuasion on the part of the midwife, as the recognised friend and adviser of the family, has almost without exception resulted in the treatment of one or both parents. We learn that up to the present time out of a total approaching 100 only a single individual has refused treatment for himself and his wife. No compulsion, of course, is available. It is easy to see how the trouble which the Public Health Department of Liverpool has taken to get and keep in sympathetic relations with the midwife has resulted in a helpful addition to the administrative machinery of its venereal scheme. The informal and friendly action of the midwife amounts to an effective system of voluntary notification without any of the attendant drawbacks of the latter.

The Suppression of Unqualified Practice.

At the quarterly meeting of the Council of the Royal College of Surgeons of England on Jan. 11th a resolution was adopted stating that it is urgently necessary, for the protection of the public, to prohibit under penalty the treatment of venereal diseases and the advertisement of such remedies by unqualified persons. The Council considered that the recommendations of the Select Committee of the House of Commons on Patent Medicines should forthwith be adopted and embodied in the proposed legislation.

A recent meeting of the Council of the Association of Municipal Corporations dealt with the same subject. A resolution, moved by the Town Clerk of Barrow-in-Furness—

> That in the opinion of this association administrative measures for the diagnosis and treatment of venereal diseases will only attain their maximum effectiveness in protecting the public health when the treatment of such diseases by unqualified persons is prevented by law—

was carried, and copies were forwarded to the Prime Minister and to the President of the Local Government Board, asking for the introduction of the necessary legislation as early as practicable.

Galyl as an Approved Salvarsan Substitute.

We have received the following letter from the Anglo-French Drug Company (Gamage Buildings, Holborn, London, E.C.):—

We are receiving queries from medical men and hospital authorities regarding the omission of galyl from the list of approved remedies on the Local Goverment Board circular. They seem to be under the impression that the omission is due to some therapeutical objection—whereas it is really owing to the miscarriage of some correspondence on the matter with the secretary of the Local Government Board. We hope to see galyl on the approval list in the very near future.

Death Accelerated by a Salvarsan Substitute.

An inquiry was held in the Southwark coroner's court on Jan. 6th concerning a man, aged 33, who died in Guy's Hospital after the administration of arsenobenzol. An intravenous dose of 0·4 grm. arsenobenzol was given and the patient died suddenly two hours after the injection. Dr. B. H. Spilsbury, who made a post-mortem examination and found a large tumour in the front part of the brain with extensive softening of the brain, stated his opinion that death was due to coma from disease of the brain, accelerated by the administration of arsenobenzol. A verdict of "Death by misadventure" was given.

Campaign of Publicity.

Two lectures of the series on public health problems, arranged by the Royal Institute of Public Health, will be devoted to the prevention and arrest of venereal disease. Dr. Mary Scharlieb deals with the subject in women on Jan. 24th and Dr. C. J. Macalister in men on Jan. 31st. On the former occasion Dr. A. Newsholme will take the chair and on the latter Lord Sydenham. Discussion is provided for after the lecture. Time and place are 4 P.M. at 37, Russell-square, London, W.C.

A course of four lectures for men has been arranged by the Liverpool Medical Institution as a branch of the National Council. The first was delivered last week by Dr. E. W. Hope on the Royal Commission's Report. Dr. R. W. MacKenna will lecture on Venereal Diseases (Jan. 19th), Professor J. M. Beattie on Social Prevention (Jan. 26th), and Dr. C. J. Macalister will preside at a conference (Feb. 2nd). Time and place are 8 P.M. at the Picton Lecture Hall, William Brown-street, Liverpool.

Sir Malcolm Morris has attempted a simple exposition of venereal diseases with special reference to their bearing upon public health in a book of 150 pages entitled "The Nation's Health," just published by Messrs. Cassell and Co. (price 3*s.* 6*d.* net). It is intended for the use of members of local authorities and of hospital boards, and for headmasters and headmistresses. The early chapters describe in non-technical language the manifestations of syphilis and gonorrhœa, their prevalence, the means of enlightenment and of providing facilities for their treatment. The questions of notification, regulation, and other administrative measures are then discussed. The book will serve a useful purpose, but the subject-matter of the book should not have been cloaked in an obscure title, the sub-title, "The Stamping Out of Venereal Diseases" not appearing on the cover at all. Undue prominence is given to a story indicating the infectiousness of syphilitic sores of the lip; the story is taken from the pages of an American journal.

Council and Other Schemes.

A private conference of doctors, clergy, and of citizens representative of various health, nursing, and public morals societies, was held in the City Hall, Belfast, last Thursday, to discuss the establishment of a local branch of the National Council for Combating Venereal Diseases.—Mr. F. S. Kidd lectured at the Trowbridge Council Chamber to the medical practitioners and officers of the R.A.M.C. in the county of Wilts on Wednesday last, by invitation of Dr. J. Tubb-Thomas, county medical officer. The address was on Modern Methods of Treatment and Diagnosis of Diseases of the Male Urethra.—At Exeter the local members of the medical profession have nominated Mr. A. C. Roper and Dr. Mabel E. Gates to advise the sanitary committee.—The committee of the Devon County Council, who are making arrangements with the local authorities for the treatment of venereal disease, has recommended that the following members of the medical profession should attend the meetings of the committee and advise: Mr. Russell Coombe, Mr. S. Noy Scott, Mr. Ellis Pearson, and Dr. G. F. Welsford.

[1] THE LANCET, 1916, ii., 1068.

LONDON HOSPITAL MEDICAL COLLEGE.—A course of three lectures on the Modern Treatment of Diabetes Mellitus will be given in the clinical theatre of the hospital by Dr. O. F. Leyton, physician to the hospital, on Wednesdays, Feb. 7th, 14th, and 21st, at 5.15 P.M. Members of the medical profession will be admitted on presentation of card.

Public Health.

ANNUAL REPORTS OF MEDICAL OFFICERS OF HEALTH.

City of Liverpool.—Dr. E. W. Hope's annual report for the year 1915, in common with most current annual reports of medical officers of health, is considerably reduced in size, but contains an excellent account of the activities of the public health department during the year under review. The population of Liverpool at the middle of the year 1915 was estimated at 772,595, an increase over the previous year of 4603. There were 21,586 births within the city, giving a birth-rate of 27·9 per 1000 of the population, the average of the previous five years (1910–14) being 30·0. There has thus been a considerable decline compared with preceding years, but the birth-rate of Liverpool is still well above the average of the great towns, which is 22·8 per 1000, as well as of England and Wales taken as a whole, which gives a rate of 21·8 per 1000. The total death-rate was 18·7 per 1000, as against 19·5 during the previous year. Zymotic diseases were the cause of 1959 deaths during the year, giving a rate of 2·5 per 1000, as compared with 2·6, which was the average rate for the preceding five years. As Liverpool, on account of the large number of ships continually arriving in the port, is peculiarly liable to the introduction of diseases from abroad, it is satisfactory to learn that no case of plague occurred in the city during the year. As a precautionary measure, the systematic catching and examination of rats has been further extended and all the usual preventive methods were employed at the docks and in warehouses, &c. A small localised outbreak of typhus fever occurred in the latter half of the year, the infection probably having been introduced from Ireland by means of lice-infected material. There were 37 cases and 6 deaths. The number of enteric fever cases was 136, 21 of which had a fatal termination. Only 3049 cases of measles were reported, as compared with 6426 in the previous year. These figures do not, however, represent the total number of measles cases occurring in the city, but have reference, for the most part, to those coming to the notice of the school authorities. The deaths from this disease numbered 256, as against 517 in 1914. The deaths from whooping-cough numbered 259, showing a slight increase over the preceding year, when there were 248. There were 2866 deaths among infants under one year, giving an infantile mortality rate of 133 per 1000 births. Much is being done to lessen the infantile mortality in Liverpool. As many as 95 per cent. of all births notified under the Notification of Births Act, 1907, have been visited by the health visitors during the year.

City of Cork.—There are some interesting items of information in Mr. Denis D. Donovan's annual report for the year 1915. The reduction in the number of cases of typhus fever in the city is well illustrated by the following figures. During the ten years 1879–88 there were 4836 cases; during the next decade 1889–98 there were 547 cases; and during the decade 1899–1908 there were 122 cases, whilst 18 cases were notified in 1909, 8 in 1910, 10 in 1911, 1 in 1912, 5 in 1913, 1 in 1914, and none in 1915. In this connexion Mr. Donovan states:—

> In my annual report for 1886 I pointed out that the opening of new areas in the congested districts, and the building of cottages for the working class population would have a decided effect in the reduction of typhus fever. This statement is now more than borne out by facts.

There has also been a considerable reduction in the number of enteric fever cases. In the ten years 1879–88, 793 cases of this disease occurred; in the following decade, 1889–98 there were 879 cases; while during the ten years 1899–1908 there were only 512 cases. The number of cases notified in 1909 was 74; in 1910, 54; in 1911, 32; in 1912, 26; in 1913, 29; in 1914, 50; and in 1915, 32. In commenting on the prevalence of enteric fever the medical officer of health informs us that some years ago a number of shallow wells were in existence in different parts of the city. As the water in these wells was found to be polluted, they were closed. Up to the year 1889 the main sewers were not ventilated; since this was done the disease has materially diminished. An effort is also being made to remedy the faulty old house drains and bad connexions that are to be met with all over the city. Mr. Donovan expresses the view that if the periodical flooding that occurs from time to time in the central flat portion of the city could be dealt with and the subsoil properly drained there would be less typhoid fever than at present. The birth-rate of Cork for the year under review is 23·18 per 1000 of the population and the infant mortality-rate 132 per 1000 births. By the passing of the Notification of Births (Extension) Act, 1915, the Notification of Births Act, 1907, came into force in the city on Sept. 1st. Under the provisions of the Infectious Disease (Notification) Act, 1889, epidemic diarrhœa has been made compulsorily notifiable. A "lady sanitary sub-officer," who is qualified to give the necessary advice and instruction to mothers regarding their own health and the care and proper feeding and clothing of their infants, has for some time been on the staff of the health department. It is hoped that, through her exertions, the number of deaths of infants will be somewhat reduced. The statement appears in this annual report that the city of Cork is in the unenviable position of having the highest consumptive death-rate of any town in Great Britain and Ireland. There were 211 deaths from this disease in 1915, or about one-eighth of the total number of deaths registered during the year. The death-rate from the malady was 2·88 per 1000. A system of voluntary notification, to which we have recently called attention, was introduced in 1907, but apparently it has proved to be of little value, and Mr. Donovan urges his council to adopt obligatory notification.

ANNUAL REPORTS FROM INDIA.

The Health of Bombay in 1915.—The population of Bombay in 1911 amounted to 979,445. The total death-rate in 1915 was 24·17 per 1000, comparing most favourably with the ratio of 35 per 1000 for the preceding quinquennium 1910–1914; the ratio is, indeed, lower than in any year since 1874, when it was 24·04 per 1000. The male death-rate was 20·33, and that for females 31·43 per 1000. It is stated by Dr. J. A. Turner, the health officer to the municipality, that "this inequality of rates of mortality among males and females is largely to be accounted for by the preponderance of males, who form nearly two-thirds of the population." About two-thirds of the inhabitants are Hindus of various castes, with an average mortality ratio of 22·77; the Mussulmans have a ratio of 30·89, while for Parsees the ratio is only 18·82 and for Europeans 13·62. The infantile mortality, 329·2 per 1000 births, is much lower than in the previous year (385·1); among Hindus the ratio was 350 and among Parsees 153 per 1000. Much has been done by means of lady health visitors, midwives, a maternity home, and the provision of milk, bed and blanket for such mothers as cannot go to the home, but all this only touches the fringe of the problem, since about 76 per cent. of the population live in one-room tenements. In Bombay, as in Calcutta, much has been done to ameliorate the conditions affecting childbirth, ten trained midwives having been appointed under Lady Willingdon's scheme to act as health visitors and induce prospective mothers to enter the municipal maternity home. A similar home at Parel and one at Colaba will before long be established. As regards epidemic diseases, the incidence was lower in 1915 than in the previous year, and in the decennium, in every case except small-pox, for which the death-rate was 0·36, compared with 0·25 in 1914 and 0·72 in the decennium (1905–1914). The most notable feature during the year was the reduction of plague to the smallest proportions on record; there were 599 deaths, giving a death-rate of 0·61 per 1000. In 1914 the ratio was 3·00, and for the decennium (1905–1914) it averaged 5·93 per 1000. The usual preventive measures—inoculation, rat destruction, evacuation and disinfection—were carried out. Small-pox prevailed to some extent, there having been 775 attacks compared with 252 in the previous year. Tuberculosis continues to decline rapidly; in 1900 the mortality ratio was 10·53 per 1000; in 1905 it was 4·10, and in 1915 only 1·74 per 1000. Lastly, the ratio for fevers (1·74 deaths per 1000) was less than in any previous year or period for which statistics are available; of the total deaths from this cause (2091), all were from malaria except 109, which were due to enteric fever. Much work is being done in regard to the control of tuberculosis; the King George V. Antituberculosis League was started, an executive committee formed, a dispensary and hospital accommodation for 25 patients were provided. Various measures have also been undertaken for improving the general sanitary condition of a particular area found to have a high tuberculous death-rate. Enteric fever has shown an apparent increase during recent

years, but it is probable that this is due to increased care in diagnosis. Dr. Turner's report on the health of Bombay is extremely interesting, and is illustrated by numerous tables and a map.

The Health of Calcutta in 1915.—The report of Dr. H. M. Crake for 1915 shows the enormous difficulties that have to be contended with in maintaining anything approaching satisfactory sanitation under the existing conditions of climate and overcrowding. Dr. Crake has calculated the ratios throughout on a population of 896,097, as ascertained by census in 1911, rather than on any hypothetically increased number of inhabitants present in 1915, and shows that any estimate of the latter must be of doubtful accuracy. The total death-rate was 28·5 per 1000, practically the same as the quinquennial average (28·6). As always, the mortality among females (37 8) largely exceeded that among males (24·1), due to the strict *purdah* system under most insanitary conditions. The highest female death-rate was 51 per 1000, in Kidderpore Ward, where the male rate was also highest, 48·1 per 1000. In Burra Bazar the female death-rate was 32·6, and the male rate only 15 per 1000; many other districts present a similar excessive female mortality. Approximately half the inhabitants of Calcutta are Hindus, with a death-rate of 29 2; that for Mahomedans being 28·0 and for Christians 25·9 per 1000. The infantile mortality (287 6) was higher than in any of the four years preceding, due especially to debility at birth, tetanus, and bronchitis. Tetanus is, of course, due to dirty midwifery, for we learn that "there has never been a single case amongst the hundreds of babies brought into the world by the corporation midwives." It is hoped that before long "baby clinics" will be established. A severe epidemic of small-pox, lasting seven months, resulted in 2560 deaths; as nearly half the deaths occurred among infants and young children under 5 years it is evident that large numbers escaped vaccination. Among the satisfactory signs of progress the extension and acceptance of vaccination is most encouraging. The total number vaccinated, 100,720, constitutes a record. The majority (77.518) were revaccinations, being about ten times the average of a non-epidemic year. The percentage of success was 39·4. Plague as an epidemic has practically disappeared, there having been only 191 deaths. There was, however, heavy rat mortality, mostly in the first three months of the year. Tuberculosis caused 1920 deaths (2·1 per 1000), the lowest record during five years. The female mortality (3·18) was double that of the male (1·6). Cholera caused 1612 deaths (1·8 per 1000), the smallest number recorded during the last 16 years. In Kidderpore Ward the ratio was 3·7 per 1000, infection being undoubtedly conveyed through contaminated water at the bathing-places. Malaria caused 1258 deaths (1·4 per 1000), and was more fatal than usual in certain wards lying east of Upper Circular-road. As the sewerage system becomes extended and the area more thoroughly drained there will certainly be a decided improvement. Anti-mosquito measures were carried out most energetically in certain wards principally affected by malaria, tanks breeding anopheles being treated three times a month. The commonest forms found in the suburban areas were *Anopheles rossii* (50 per cent.), *nigerrimus*, and *barbirostris*. In view of the opening of the Panama Canal a plan of operations has been worked out for dealing with the stegomyia problem. The most urgent matter at present is stated to be the control of stegomyia in the Port area, where there appears to be an absence of an adequate general sanitary organisation. Observations were made on the effects of storage of the Hugli river water, in comparison with sand filtration; in the settling tanks lactose-fermenting bacteria were generally found in 5 c.c., but rarely in $\frac{1}{5}$ c.c., while in the filtered water they were generally absent in 10 c.c. The report is accompanied by numerous diagrams, tables, and a map.

URBAN VITAL STATISTICS.

(Week ended Jan. 6th, 1917).

English and Welsh Towns.—In the 96 English and Welsh towns, having an aggregate population estimated at nearly 18,000,000 persons, the annual rate of mortality during the week was equal to 18·9 per 1000 of the population, against 23·7 and 21·9 per 1000 in the two preceding weeks. Among the several towns the death-rate ranged from 8·9 in Rotherham, 10·6 in Cambridge, and 11 9 in Gloucester, to 27·7 in Oxford, 29·6 in Bath, and 35·4 in Bournemouth. The annual rate in London, with a population of more than 4,000,000, was equal to 19·6, or 4·1 per 1000 less than that recorded in the previous week. In the 96 towns, the principal epidemic diseases caused 207 deaths, which corresponded to a rate of 0·6 per 1000, and included 64 from infantile diarrhœa, 61 from measles, 50 from diphtheria, 17 from whooping-cough, 8 from scarlet fever, and 7 from enteric fever. The deaths from each of these diseases were below the average in the four preceding weeks. The deaths from diphtheria included 11 in London, 5 in Birmingham, and 3 in Derby. The number of scarlet fever patients under treatment in the Metropolitan Asylums Hospitals and in the London Fever Hospitals had further declined at the end of the week to 869; and the cases of diphtheria had also declined to 1431. Of the 6270 deaths from all causes in the 96 towns, 216 resulted from violence. The causes of 68 of the total deaths were uncertified, of which 15 were registered in Birmingham, 11 in Liverpool, and 4 in St. Helens.

Scotch Towns.—The deaths registered in Glasgow numbered 397, and were equal to an annual rate of 18·6, against 19·6 per 1000 in London, and included 7 from infantile diarrhœa, 4 from whooping-cough, 2 from diphtheria, and one each from measles and scarlet fever. Of the 397 deaths, 77 were of infants under 1 year and 92 of persons aged 65 years and upwards. The 117 deaths from all causes in Edinburgh corresponded to an annual rate of 18·4 per 1000, and included 7 of infants under one year and 44 of persons aged 65 years and upwards. Four deaths were referred to diphtheria, and one each to whooping cough and infantile diarrhœa.

Irish Towns.—The 202 deaths registered in Dublin during the week were equal to an annual rate of 26·4 per 1000, and included 4 from infantile diarrhœa, 2 from measles, and 1 from enteric fever. The causes of 9 deaths were uncertified. The 145 deaths in Belfast corresponded to an annual rate of 19·2, against 21·3 per 1000 in the previous week. These deaths included 2 from infantile diarrhœa and 1 each from measles and diphtheria. The causes of 5 of the total deaths were uncertified.

(Week ended Jan. 13th, 1917.)

English and Welsh Towns.—In the 96 English and Welsh towns having an aggregate population estimated at nearly 18,000,000 persons, the annual rate of mortality during the week was equal to 16·8 per 1000 of the population, against rates declining from 23·7 to 18·9 per 1000 in the three preceding weeks. Among the several towns the death-rate ranged from 6·6 in West Hartlepool, 8·0 in Grimsby, and 10·0 in Eastbourne, to 22·6 in St. Helens, 24·8 in Bury, and 27·0 in Hastings. The annual rate in London, with a population of more than 4,000,000, was equal to 17·6, or 2·0 per 1000 below that recorded in the previous week. In the 96 towns the principal epidemic diseases caused 210 deaths, corresponding to a rate of 0·6 per 1000, and included 67 from infantile diarrhœa, 57 from measles, 45 from diphtheria, 25 from whooping-cough, 10 from enteric fever, and 6 from scarlet fever. The deaths from enteric fever and whooping-cough exceeded, while those from the remaining diseases were below, the average in the three preceding weeks. Measles caused a death-rate of 3·7 in Wimbledon; of the 45 deaths referred to diphtheria, 9 occurred in London, and 4 each in Birmingham and Liverpool. The number of scarlet fever and diphtheria patients in the Metropolitan Asylums Hospitals and the London Fever Hospitals had further declined to 829 and 1395 respectively by the end of the week. Of the 5594 deaths from all causes in the 96 towns, 193 resulted from violence. The causes of 46 of the total deaths were uncertified, and included 10 in Liverpool, 8 in Birmingham, and 5 in Gateshead.

Scotch Towns.—The 388 deaths recorded in Glasgow corresponded to an annual rate of 18·1, against 17·6 per 1000 in London, and included 9 from whooping-cough, 5 from infantile diarrhœa, 3 from diphtheria, 2 from measles, and 1 from enteric fever. Of the 388 deaths, 59 were of infants under 1 year and 110 of persons aged 65 years and upwards. In Edinburgh the 114 deaths were equal to a rate of 17·9, or 0·5 per 1000 below that in the previous week, and included 3 from diphtheria and 1 from whooping-cough.

Irish Towns.—The 161 deaths registered in Dublin were equal to an annual rate of 21 0 per 1000, and included 3 from measles and 1 from infantile diarrhœa. The causes of 12 deaths were uncertified. The 155 deaths in Belfast corresponded to a rate of 20·6, or 1·4 per 1000 above that in the previous week, and included 4 from infantile diarrhœa and 1 each from whooping-cough and diphtheria.

VITAL STATISTICS OF LONDON DURING DECEMBER, 1916.

In the accompanying table will be found summarised complete statistics relating to sickness and mortality in the City of London and in each of the metropolitan boroughs. With regard to the notified cases of infectious diseases, it appears that the number of persons reported to be suffering from one or other of the ten diseases specified in the table was equal to an annual rate of 3·9 per 1000 of the population, estimated at 4,310,030 persons in the middle of the year; in the three preceding months the rates were 4·9, 5·4, and 5·0 per 1000. The lowest rates last month were recorded in the City of Westminster, Hampstead, Stoke Newington, the City of London, and Wandsworth; and the highest rates in Holborn, Bethnal Green, Stepney, Deptford, and Greenwich. The prevalence of scarlet fever showed a marked decline from that recorded in the preceding month; this disease was proportionally most prevalent last month in Paddington, Kensington, Fulham, Bethnal Green, Bermondsey, and Lewisham. There were 913 scarlet fever patients under treatment in the Metropolitan Asylums Hospitals at the end of last month, against 1117 and 1066 at the end of the two preceding months; the weekly admissions averaged 95, against 160 and 131 in the two preceding months. Diphtheria also was much less prevalent than it had been in other recent months; the greatest proportional prevalence of this disease was recorded in Holborn, Bethnal Green, Stepney, Southwark, Deptford, and Greenwich. The number of diphtheria patients under treatment in the Metropolitan Asylums Hospitals, which had been 1479 and 1543 at the end of the two preceding months, had declined again to 1479 at the end of last month; the weekly admissions averaged 143, against 209 and 187 in the two preceding months. The prevalence of enteric fever was considerably less than in either of the two preceding months; of the 23 cases notified during the month, 4 belonged to Islington, 4 to Wandsworth, 3 to Camberwell, and 2 to Paddington. The Metropolitan Asylums Hospitals contained 37 enteric fever patients at the end of last month, against 39 and 42 at the end of the two preceding months; the weekly admissions averaged 5, against 7 in each of the three preceding months. Erysipelas was proportionally most prevalent last month in Paddington, Holborn, Bethnal Green, Poplar, Deptford, and Greenwich. The 29 cases of puerperal fever included 4 in Camberwell, 3 in Fulham, 3 in

Wandsworth, and 2 each in Kensington, Islington, Stepney, Poplar, Bermondsey, and Woolwich. Of the 24 cases of cerebro-spinal meningitis, 4 belonged to Islington, 4 to Finsbury, 3 to Lambeth, 2 to Stepney, and 2 to Woolwich; while the 5 cases of poliomyelitis belonged respectively to Hammersmith, Stepney, Bermondsey, Lambeth, and Lewisham.

The mortality statistics in the table relate to the deaths of persons actually belonging to the several metropolitan boroughs, the deaths occurring in institutions having been distributed among the boroughs in which the deceased persons had previously resided. During the four weeks ended Dec. 30th the deaths of 7475 London residents were registered, equal to an annual rate of 22·6 per 1000 of the population; in the three preceding months the rates were 12·0, 12·0, and 14·5 per 1000 respectively. The death-rates last month ranged from 14·7 in the City of London, 18·3 in Lewisham, 18·8 in Hampstead, 19·0 in Wandsworth, 19·4 in Hackney, and 19·6 in Stepney, to 25·9 in Southwark, 26·4 in Kensington, 26·7 in Shoreditch, 26·9 in St. Marylebone, 28·8 in Finsbury, and 29·0 in Chelsea. The 7475 deaths from all causes included 271 which were referred to the principal infectious diseases; of these, 99 resulted from measles, 5 from scarlet fever, 49 from diphtheria, 15 from whooping-cough, 3 from enteric fever, and 100 from diarrhœa and enteritis among children under two years of age. No death from any of these diseases was recorded last month in the City of London; among the metropolitan boroughs they caused the lowest death-rates in Kensington, Hampstead, Holborn, and Wandsworth, and the highest rates in Chelsea, Shoreditch, Bethnal Green, Poplar, Bermondsey, Greenwich, and Woolwich. The 99 fatal cases of measles were 16 fewer than the corrected average number in the corresponding period of the five preceding years; this disease was proportionally most fatal last month in Bethnal Green, Poplar, Southwark, Bermondsey, Greenwich, and Woolwich. The 5 deaths from scarlet fever were 14 below the corrected average number, and included one each in St. Marylebone, Stoke Newington, Southwark, Lambeth, and Camberwell. The 49 fatal cases of diphtheria showed a decline of 6 from the corrected average number; the greatest proportional mortality from this disease was recorded last month in Chelsea, Bethnal Green, Stepney, and Camberwell. The 15 deaths from whooping-cough were only one-third of the corrected average number, and included 3 in Shoreditch, 3 in Lambeth, and 2 in Hackney. The deaths from enteric fever, which had averaged 10 in the last four weeks of the five years 1911–15, fell last month to 3, of which 2 belonged to the City of Westminster and 1 to Greenwich. The 100 deaths from diarrhœa and enteritis among children under 2 years of age were 15 above the average; the greatest proportional mortality from this cause was recorded in Hammersmith, Fulham, Chelsea, Islington, Shoreditch, Bethnal Green, and Bermondsey. In conclusion it may be stated that the aggregate mortality in London last month from the principal infectious diseases was 17·6 per cent. below the average.

ANALYSIS OF SICKNESS AND MORTALITY STATISTICS IN LONDON DURING DECEMBER, 1916.

(Specially compiled for THE LANCET.)

CITIES AND BOROUGHS.	Estimated civil population, 1915.	Notified Cases of Infectious Disease.											Deaths from Principal Infectious Diseases.								Deaths from all causes.	Death-rate per 1000 living.
		Small-pox.	Scarlet fever.	Diphtheria.*	Typhus fever.	Enteric fever.	Other continued fevers.	Puerperal fever.	Erysipelas.	Cerebro-spinal meningitis.	Poliomyelitis.	Total.	Annual rate per 1000 persons living.	Small-pox.	Measles.	Scarlet fever.	Diphtheria.*	Whooping-cough.	Enteric fever.	Diarrhœa and enteritis (under 2 years).	Total.	Annual rate per 1000 persons living.		
LONDON	**4,310,030**	—	**406**	**569**	—	**23**	—	**29**	**217**	**24**	**5**	**1273**	**3·9**	—	**99**	**5**	**49**	**15**	**3**	**100**	**271**	**0·8**	**7475**	**22·6**
West Districts:																								
Paddington	131,397	—	20	6	—	2	—	—	14	—	—	42	4·2	—	—	—	—	—	—	4	4	0·4	234	23·2
Kensington	155,795	—	20	10	—	1	—	2	4	—	—	37	3·1	—	—	—	—	1	—	3	4	0·3	316	26·4
Hammersmith ...	118,559	—	7	16	—	—	—	1	2	—	1	27	3·0	—	—	—	1	—	—	6	6	0·7	199	21·9
Fulham	151,161	—	20	17	—	—	—	3	4	1	—	45	3·9	—	—	—	—	—	—	6	6	0·5	244	21·0
Chelsea	58,421	—	6	10	—	—	—	—	4	—	—	20	4·5	—	1	—	2	—	—	3	6	1·3	130	29·0
City of Westminster	135,104	—	6	15	—	1	—	—	4	1	—	27	2·6	—	4	—	2	—	2	2	10	1·0	234	22·6
North Districts:																								
St. Marylebone ...	100,280	—	7	8	—	—	—	—	6	1	—	22	2·9	—	—	1	—	—	—	2	3	0·4	207	26·9
Hampstead	81,760	—	6	5	—	—	—	—	2	—	—	13	2·1	—	—	—	1	1	—	—	2	0·3	118	18·8
St. Pancras	200,322	—	17	27	—	1	—	1	11	—	—	57	3·7	—	7	—	2	1	—	5	15	1·0	394	25·6
Islington	316,242	—	37	32	—	4	—	2	9	4	—	88	3·6	—	1	—	—	1	—	15	17	0·7	583	24·0
Stoke Newington...	50,527	—	2	3	—	—	—	—	—	—	—	5	1·3	—	—	1	—	—	—	—	1	0·3	89	23·0
Hackney	217,883	—	23	20	—	1	—	1	8	—	—	53	3·2	—	1	—	—	2	—	4	7	0·4	325	19·4
Central Districts:																								
Holborn	40,405	—	3	9	—	—	—	—	5	—	—	17	5·5	—	—	—	—	—	—	1	1	0·3	79	25·5
Finsbury	76,915	—	6	13	—	—	—	1	2	4	—	26	4·4	—	—	—	1	1	—	3	5	0·8	170	28·8
City of London ...	19,461	—	2	—	—	—	—	—	—	—	—	2	1·3	—	—	—	—	—	—	—	—	—	22	14·7
East Districts:																								
Shoreditch	103,627	—	9	14	—	1	—	—	7	1	—	32	4·0	—	—	—	2	3	—	5	10	1·3	212	26·7
Bethnal Green ...	120,207	—	16	33	—	1	—	1	19	1	—	71	7·7	—	6	—	4	—	—	5	15	1·6	199	21·6
Stepney	265,731	—	31	54	—	1	—	2	20	2	1	111	5·4	—	4	—	7	—	—	1	12	0·6	400	19·6
Poplar	156,247	—	11	22	—	—	—	2	14	—	—	49	4·1	—	9	—	3	—	—	5	17	1·4	257	21·4
South Districts:																								
Southwark	179,424	—	7	39	—	—	—	—	11	1	—	58	4·2	—	9	1	3	—	—	2	15	1·1	357	25·9
Bermondsey	117,188	—	22	10	—	—	—	2	7	1	1	43	4·8	—	14	—	1	—	—	5	20	2·2	221	24·6
Lambeth	284,188	—	27	30	—	1	—	1	11	3	1	74	3·4	—	7	1	3	3	—	7	21	1·0	502	23·0
Battersea	161,945	—	16	25	—	—	—	1	5	1	—	48	3·9	—	3	—	2	1	—	2	8	0·6	255	20·5
Wandsworth	312,249	—	21	23	—	4	—	3	7	1	—	59	2·5	—	3	—	2	—	—	3	8	0·3	455	19·0
Camberwell	254,385	—	21	35	—	3	—	4	9	—	—	72	3·7	—	4	1	7	—	—	8	20	1·0	441	22·6
Deptford	110,299	—	8	26	—	1	—	—	13	—	—	48	5·7	—	—	—	2	—	—	2	4	0·5	207	24·5
Greenwich	96,385	—	4	30	—	—	—	—	9	—	—	43	5·8	—	12	—	1	1	1	—	15	2·0	180	24·3
Lewisham	164,438	—	22	16	—	—	—	2	5	—	1	44	3·5	—	2	—	2	—	—	2	6	0·5	231	18·3
Woolwich...	129,506	—	9	21	—	—	—	—	5	2	—	39	3·9	—	12	—	1	—	—	—	13	1·3	214	21·5
Port of London ...	—	—	—	—	—	1	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—

* Including membranous croup.

THE SERVICES.

ROYAL NAVAL MEDICAL SERVICE.

To be Temporary Surgeon: **H. F. Seymour.**

The following appointments have been notified:—Fleet-Surgeons: R. M. Richards and E. B. Pickthorne to the *Victory*: G. M. Eastment to the *Kent*. Staff Surgeons: R. H. St. B. E. Hughes to the *Pembroke* and A. H. Richardson to the *Research*. Surgeons: E. C. Holtom and F. J. R. Cowie to the *Pembroke*. Temporary Surgeons: N. N. Wade to Haslar Hospital; R. M. Barrow to *Swiftsure*: W. H. Sarra to *Cæsar*; J. E. Scanlan to *Cochrane*: G. C. Mort to *Pomone*, additional, for Dartmouth College; M. Prior to *Vivid*, additional, for disposal; and H. W. Cooke to *Vivid*, additional, for Plymouth Hospital.

ARMY MEDICAL SERVICE.

Lieut.-Col. R. Caldwell, from R.A.M.C., to be Colonel, and to be supernumerary.

Temp. Lieut.-Cols. R. Jones and H. G. Barling (Majors, R.A.M.C., T.F.) to be temporary Colonels.

ROYAL ARMY MEDICAL CORPS.

Lieutenant-Colonels to be acting Colonels whilst employed as Assistant Directors of Medical Services of a Division: H. M. Morton, H. Hewetson, W. E. Hudleston.

The undermentioned relinquish the rank of temporary Lieutenant-Colonels on reposting: Bt. Lieut.-Col. FitzG. G. FitzGerald, Major M. F. Grant, Major A. R. C. Parsons.

Temp. Lieut.-Col. R. J. R. C. Simons (Major R.A.M.C., T.F.) relinquishes his temporary rank.

Captains (acting Lieutenant-Colonels) relinquishing their acting rank on reposting: A. S. Williams, D.S.O., A. R. Wright.

Majors to be temporary Lieutenant-Colonels whilst in command of a Casualty Clearing Station: J. M. B. Rahilly, J. G. Bell, D.S.O.

Major W. J. P. Adye-Curran to be temporary Lieutenant-Colonel whilst in command of a General Hospital.

Major R. T. Collins to be temporary Lieutenant-Colonel whilst in command of a Field Ambulance.

Major G. S. Mansfield to be temporary Lieutenant-Colonel while employed as an Assistant Director of Medical Services, Home Forces.

Major W. J. Waters to be acting Lieutenant-Colonel whilst in command of a General Hospital.

Captains (acting Majors) to be acting Lieutenant-Colonels whilst in command of a Field Ambulance: W. I. Thompson, F. Worthington, D.S.O., G. H. Dive, A. S. Littlejohns, A. S. Williams, D.S.O., E. M. O'Neill, D.S.O., J. J. O'Keeffe, A. R. Wright, A. D. Fraser, W. G. Wright, A. G. Wells, T. B. Nicholls, T. T. H. Robinson, F. H. Bradley, J. D. Bowie, F. L. Bradish, T. S. Eves, E. C. Phelan, W. H. Forsyth, E. J. Kavanagh, W. K. Beaman, H. Gibson.

Captains to be acting Lieutenant-Colonels whilst in command of a Field Ambulance: W. B. Burdon, E. D. Caddell, D. F. Mackenzie, G. B. Edwards, C. R. M. Morris, R. Hemphill, W. Egan, C. W. Bowie, J. du P. Langrishe.

Temporary Captains (acting Majors) to be acting Lieutenant-Colonels whilst in command of a Field Ambulance: J. R. C. Greenlees, D.S.O., H. Faulkner.

Temporary Capt. J. la F. Lauder, D.S.O., to be acting Lieutenant-Colonel whilst in command of a Field Ambulance.

Capt. W. I. Thompson to be temporary Major whilst in command of a Field Ambulance.

Temporary Captains to be temporary Majors: N. H. Mummery, F. C. Hart-Smith, J. R. Lee.

F. A. G. Jeans to be temporary Honorary Major while employed with No. 6 British Red Cross Hospital (Liverpool Merchants' Mobile).

Temporary Lieutenants to be temporary Captains: J. L. Whatley, G. A. Hayman, T. Forsyth, C. Witts, C. G. Lambie, A. S. Sieger, W. D. Cruickshank, J. P. MacDonald, F. W. Rigby, J. H. Crofton, W. E. Hills, W. Parker, T. W. S. Morton, H. C. W. Allott, A. W. Allen, J. Welsh, D. Kennedy, W. Darlington, O. V. Burrows, J. Appleyard, J. T. O'Boyle, G. A. MacFarland, C. D. Holdsworth, J. G. Craig, C. F. Rumsey, H. J. Nightingale, H. G. Smith, L. Fraser, W. Duffy, T. H. Twigg, L. D. I. Graham, T. L. Price, D. M. Clements, H. M. Vickers, H. Goodman, D. M. Moffatt, W. H. Blakemore, W. Hamilton, F. M. Murray, G. Thomson, L. Levene, P. E. B. Barrow, P. A. B. Clark, M. Chadwick, D. W. Daniels, J. S. Dunn, G. C. Linder, R. A. Johnston, J. McIntyre, F. L. Hill, W. A. R. Michell, J. H. Egbert, W. G. Macdonald, R. S. Dollard, H. E. Bloxsome, S. A. D'Arcy, F. Hannigan, O. Carlyle, W. C. Mence, H. H. Fisk, D. H. Derry, C. S. Vartan, J. K. Davies, W. Wilson, F. M. Byrne, J. Smith, R. Proctor, G. S. Clancy, G. T. Baker, J. B. MacKay, C. A. Dupont, J. C. A. Ridgway, H. G. Baynes, H. C. Watson, J. D. Robertson, H. F. Sheldon, W. J. Weaver.

Lieut. A. R. Wightman, from 3rd Northern General Hospital (T.F.), to be temporary Lieutenant.

To be Lieutenants and granted the rank of temporary Captain: Temp. Captains: G. D. Jamieson, D. W. Pailthorpe, St. J. D. Buxton, S. Arnott, T. L. Fraser, L. G. Bourdillon, G. A. Lilly, J. Sainsbury, G. D. Robertson, H. D. F. Brand, J. P. Little, C. J. O'Reilly, D. C. Monro, W. Foot, F. C. K. Austin, G. A. E. Argo, S. S. Crosse, R. W. Galloway, G. D. Harding, J. A. Andrews, H. J. Couchman, R. C. Robertson, W. A. Sneath, A. L. Aymer, A. N. Minns, D. Pottinger, D. Bell, D. G. Cheyne, P. A. Opie, A. S. Taylor, H. C. Godding, D. W. Beamish, W. L. E. Reynolds, H. A. Rowell, O. B. Pratt, J. H. Boag, C. R. Dudgeon, H. E. A. Boldero, R. C. Matson, H. R. Sheppard, R. L. Ritchie, E. S. Cuthbert, J. La F. Lauder, D.S.O., T. H. Sarsfield, J. F. Bourke, H. J. Bower, A. F. G. Guinness. Captain from R.A.M.C. (T.F.): R. E. Barnsley. Captains from R.A.M.C. (Special Reserve): E. Davies, T. J. Kelly, R. J. Clausen, C. McN. McCormack, E. F. W. Grellier, O. Hairsine, A. B. Preston, R. Ellis, F. G. A. Smyth, J. C. A. Dowse, C. O. Shackleton, F. P. Freeman, A. M. McCutcheon, H. H. Mulholland, A. C. Jebb, E. B. Marsh, C. W. Treherne, J. H. Pendered, W. W. MacNaught, J. P. Litt, H. A. Harbison, W. G. Shakespear, A. L. Robb, E. Catford, A. F. J. Patterson, C. J. D. May, T. P. Rankin, W. C. Hartgill, T. F. Kennedy, K. A. M. Tomory, J. S. Sloper, C. Wilson, H. N. Stafford, R. I. Sullivan, R. A. Anderson, F. M. Lipscomb, H. P. Rudolf, D. N. Macleod, G. B. Hadden, R. P. Cormack, G. S. Pirie, W. K. Campbell, G. H. Haines, R. B. Myles, R. R. Thompson, A. E. Richmond, E. Jamieson, J. E. Brooks, W. H. A. D. Sutton, G. T. Gimlette, W. L. A. Harrison, F. R. S. Shaw, R. Stowers, O. D. Jarvis, J. A. Binning.

H. P. Thompson to be temporary Honorary Lieutenant.

Temp. Major John M. Atkinson relinquishes his commission on account of ill-health.

Temporary Captains relinquishing their commissions: F. A. R. Hacker, A. Dingwall Fordyce, G. Norman, G. A. Finlayson, G. W. Thompson, N. D. Bardswell, J. R. H. Walker, E. J. Stubbs, R. R. Forbes, J. R. Dobbin, J. A. Gentle (on account of ill-health).

Temp. Hon. Capts. W. Gemmell, H. Bowring, J. Beckett, and W. D. Coplestone relinquish their commissions.

Temporary Lieutenants relinquishing their commissions: J. C. Forbes, A. W. Brodribb, L. W. May, T. F. Wilson, C. J. R. Joyce, J. J. McMillan, C. K. Stevenson, J. McDonald, E. Rommel, R. J. Bethune, N. H. Austin, J. F. MacLeod, M. G. Pettigrew, J. Bowen-Jones, J. A. K. Griffiths, C. H. G. Ross, G. Stowell, C. H. Ferguson, C. H. Phillips, J. Pender, T. H. Clarke, H. L. Askham, A. Barrett, H. P. Thompson, S. D. Bridge, A. O. Evans, J. G. Bell, F. M. Bishop, R. A. McNeill, R. T. Slinger, W. H. Broughton, A. E. Clark, H. A. Watney, G. R. Potter, J. C. Mead, J. M. Hermon, W. J. McL. Baird, W. H. Hodgson, H. M. Mills, J. W. Hilliard, T. A. Mayo, G. Kee, N. Navarra, H. Harrison, H. F. Johns, W. Bligh, H. W. M. Strover, P. Stocks, W. J. Ashby, V. Colmer, H. E. Brown, P. A. Nightingale, A. T. Thompson, J. D. Stewart, C. J. Pentland.

SPECIAL RESERVE OF OFFICERS.

Captains (acting Majors) to be acting Lieutenant-Colonels whilst in command of a Field Ambulance: M. R. Taylor, D. C. Barron, K. D. Murchison.

Capt. A. H. Habgood to be acting Lieutenant-Colonel whilst in command of a Field Ambulance.

Lieutenants to be Captains: J. Cullenan, C. O. J. Young, N. A. Martin.

To be Lieutenants: F. K. Hayman, from Bristol Contingent, O.T.C.; T. Stanton, from Dublin University Contingent, O.T.C.; G. E. Archer, from University of Manchester Contingent, O.T.C.; W. Burridge.

TERRITORIAL FORCE.

Lieut.-Col. H. G. Barling is now seconded whilst holding a temporary commission in the Army Medical Service.

Major (Temp. Lieut.-Col.) G. M. Hetherington relinquishes his commission on account of ill-health.

Major A. N. Davis resigns his commission on account of ill-health, and is granted the honorary rank of Major.

Capt. H. Beeney relinquishes his commission on account of ill-health, contracted on active service, and is granted the honorary rank of Captain.

Capt. F. C. Bentz relinquishes his commission on account of ill-health caused by wounds, and is granted the honorary rank of Captain.

Lieutenants to be Captains: N. R. Williamson, A. J. A. McCabe-Dallas, A. M. Jones, T. B. McKee, S. K. McKee.

Attached to Units other than Medical Units.—Lieut. J. A. Hartley to be Captain. Major J. F. Crombie to be temporary Lieutenant-Colonel whilst commanding a Field Ambulance.

INDIAN MEDICAL SERVICE.

Lieutenant-Colonel to be Colonel: W. E. Jennings.

Lieutenant-Colonels to be temporary Colonels: G. B. Irvine, C. N. C. Wimberley.

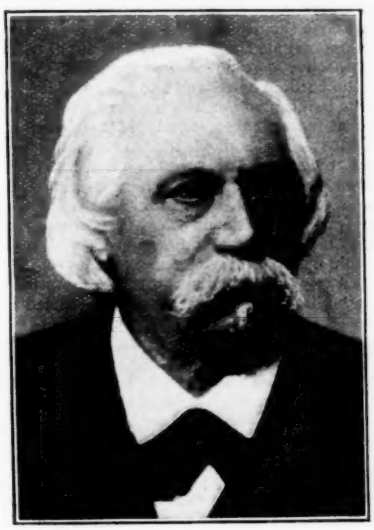
To be Lieutenants: I. D. Grant, A. H. Brown, E. Cotter, H. E. Murray.

Obituary.

JEAN BAPTISTE AUGUSTE CHAUVEAU.

Auguste Chauveau, whose death in his ninetieth year we recorded last week, had outlived all his famous co-workers of earlier years. E. J. Marey had long predeceased him, while Charles Bouchard, his coadjutor in founding the *Journal de Physiologie et de Pathologie Générale*, died in October, 1915. Associated thus in the direction of an influential journal, the spheres of activity of Bouchard and Chauveau were yet widely different: the former was an eminent and well-beloved physician, the latter will be remembered as a many-sided biologist and one of the makers and masters of physiology during the latter half of last century. He was also a great comparative pathologist, doing pioneer work on various contagions, including tuberculosis, which had an intimate bearing on practical and preventive medicine. His energies, however, were not confined to this borderland between pathology and medicine, for he became a fine exponent of veterinary medicine.

Auguste Chauveau was born at Villeneuve-le-Guyard (Yonne) on Nov. 23rd, 1827, and, like many other provincials, gravitated to Paris, where he studied at Alfort—



AUGUSTE CHAUVEAU.

the great veterinary school just outside Paris—and also in the Faculty of Medicine of Paris, as well as at the Veterinary School of Lyons. He was elected on the staff of the Lyons Veterinary School at the age of 21, and ultimately its director in 1875. His wide knowledge of the subject led to his appointment as inspector-general of the Veterinary Services in France. Later on his keen interest in the advancement of physiology and pathology found a new and wider sphere on his appointment as professor of comparative pathology at the Natural History Museum in Paris, where he built an entirely new institute fitted for the study of comparative physiology and pathology. In Paris Chauveau took an active interest in all that went on in the medical societies. He was a member of the Institute at the Academy of Sciences, where he sat not as a physiologist but in the agricultural economy section, just as Pasteur did not sit as a chemist but as a representative of mineralogy. He was also a member and regular attendant at the Academy of Medicine, as well as at the Society of Biology, of which he was at one time president. At these gatherings his genial presence and bonhomie, his interest in all newer scientific work, and also in the younger workers themselves, made him a highly popular figure.

Chauveau's published writings cover a very extensive field. Some of the more important may be mentioned. In 1868 he

published his "Nature des Virus," showing the "corpuscular state" of the virulent agents and the inactivity of the fluid in which they float. This was based on an earlier essay, entitled "Sur la Non-spontanéité des Maladies Virulentes." In the same year appeared a series of important studies on tuberculosis dealing with its virulence, the transmission by way of the digestive tract, and its contagious character in animals and man. Papers followed on the mechanism of natural contagion, on the attenuation of viruses and preventive inoculation, on the presence of pathological microbes in blood, in persons apparently in good health, on cow-pox and its relation to small-pox. Puerperal septicæmia and gangrene were also studied. While still at Lyons he published his "Traité d'Anatomie Comparée des Animaux Domestiques," the second edition of which, revised and augmented by S. Arloing—at that time professor in Toulouse—was translated into English by the late Professor George Fleming and published in 1873. Bio-chemical problems also attracted him. He and his pupils did work on glycogenesis and on the formation and use of sugar in the organism. With Kaufmann in 1886 he attempted to solve the problem whether circulating sugar can be immediately utilised by active muscles. They came to the conclusion that an active muscle, such as the masseter of the horse, uses about three and a half times as much blood sugar as the corresponding resting muscle—results confirmed later by Quinquaud in 1886 and by Morat and Dufourt in 1892.

It is, however, as the explorer of the movements of the living heart that Chauveau will probably be best remembered. As a contemporary of Ludwig and co-worker with Marey, his earliest researches were devoted to the study of the different phases of the cardiac cycle and the intracardiac pressure, the observations being made on the heart of a horse by means of the now classical cardiac sound of Chauveau and Marey, utilising Marey's method of air-transmission of variations of pressure by means of tubes and recording tambours. Probably few of the younger physiologists in this country have seen such an experiment, but as recently as the International Congress of Physiologists at Liége Chauveau repeated this famous demonstration. The horse quietly munched its oats in the stable below, while the movements of its heart were recorded in the auditorium above. The main results of this work were published in a little brochure, entitled "Nouvelles Recherches expérimentales sur les Mouvements et les Bruits normales du Cœur," by Baillière in 1856. Fuller details may be found in Marey's "La Circulation du Sang." In 1860 Chauveau constructed, with Lortet, the hæmodromograph to measure the variations in the velocity of the blood in large arteries. Amongst other results they recorded the increase of velocity of the blood during systole of the left ventricle, and the increased rate of flow in the carotid artery during mastication.

Chauveau's personal characteristics made him widely known outside his immediate circle. He had a gracious and commanding presence. His massive, almost leonine, head, set on a powerful and strongly built body, made him a striking figure on public occasions. He was a great friend of the late Sir J. Burdon-Sanderson, and some of their work was done in the same region of physiology. Allusion has already been made to his catholicity of outlook and his encouragement of the work of younger investigators. Chauveau's long life was dedicated to the advancement of knowledge, and his memory will live as truly in the work which his encouragement and inspiration produced at the hands of his pupils as in his own many-sided achievements.

MARY BIRRELL DAVIES, L.R.C.P., L.R.C.S. EDIN., L.F.P.S. GLASG.

LIVERPOOL has lost a remarkable member of the medical profession by the death of Mary Birrell Davies, which occurred on Dec. 30th, 1916. She was not only a most active practitioner, but exerted a wide influence for the good of the people by her personality and organising ability. Miss Davies had a wide *clientèle* among all classes of women in a professional capacity and also as a sympathetic advisor and counsellor. For many years she had interested herself in matters having to do with social welfare and her kindness and gentleness, combined with strength of character, gave her an influence which she used to the uttermost.

Immediately after the outbreak of war she initiated the Women's War Service Bureau and organised it in conjunction with Mrs. Herbert Rathbone, then the Lady Mayoress. This organisation has done and is still doing splendid work. In October, 1914, she went to France and did good service at Boulogne, but her failing health compelled her return towards the end of the year. Her next war work was to start and to carry into effect the Soldiers' and Sailors' Club in Lime-street, where she worked as supervisor for several months. Finally she superintended the organisation and equipment of Lady Sefton's Hospital for Officers at Croxteth Hall and remained there as resident administrator until a few weeks before her death, when her progressive illness rendered it no longer possible for her to continue there.

Among other departments of public work with which Miss Davies was connected may be mentioned the Girl Guides movement. She was instrumental in setting this going and was appointed commissioner, a position which she held to the end and in which she did invaluable work, not only in Liverpool, but for the movement generally. She was a member of the Victoria Women's Settlement, and acted as adviser to the Juvenile Employment Section of the Labour Exchange. In connexion with the Women's Patrol movement she spoke at many of the meetings, and she was an active member of the Liverpool Medical Institution Committee for Combating the Venereal Diseases from the time of its inception in 1913. Under the Home Office she held the office of inspector of children's institutes under the Children Act. Among women of the working classes she was well known and frequently addressed them with the object of inducing them to exert their responsibilities, more especially in the direction of bringing up their children to recognise the physical as well as the moral benefits of a well-ordered life.

Any appreciation of Miss Davies's life and work would be incomplete without reference to her genius for friendship with other women. "Her closest friends were so almost comically different and unlike each other that there didn't seem room for jealousy, and it only shows how many-sided she was that she needed us all to companion her properly. In her relationships towards men her infinite tact and personal magnetism, combined with her professional ability, established a kindly feeling of comrade-ship which did much to bring about those good relationships which have for long existed between medical men and their professional sisters in Liverpool." (We quote from the letter of a Liverpool friend.)

She was among the bravest of women. For several years she had been under the shadow of a mortal and painful illness, which she never permitted to interfere with the work that she carried out to the end with devotion and with all the energy of which her diminishing strength was capable.

THE University College of South Wales and Monmouthshire is endeavouring to raise a sum of £100,000 for the erection of laboratories for work in relation to local industries.

AT an inquest in the City on a woman munition-worker who died of T.N.T. poisoning in St. Bartholomew's Hospital the jury added a rider to their verdict suggesting that munition-workers should be medically examined once a fortnight.

A RURAL ORGANISATION COUNCIL.—With the objects of increasing the supply of home-grown food and coördinating and preventing the overlapping of societies concerned in improving the conditions of rural life in the homeland, a Rural Organisation Council has been formed. Some of the leading societies concerned with agricultural organisation, rural housing, rural education, local government, handicrafts, and industries have already joined the Council, which, by promoting a regular interchange of opinion between itself and the constituent societies, will, it is hoped, strengthen local efforts. A central organisation should be better able to direct collective action. As is pointed out in a circular asking for a sum of money proportional to the importance of the objects in view, the war now gives an excellent opportunity for organising a better development of the conditions of rural life against the day of disbanding, when vast numbers of sailors and soldiers will be set free, many of whom may desire a life on the land. The temporary office of the new Council is at one of the constituent societies, the National Land and Home League, Queen Anne's Chambers, Westminster, S.W., of which Lord Henry Bentinck, M.P., is the president and Lord Saye and Sele the chairman. Mr. T. Hamilton Fox is the honorary secretary of the Organisation Council.

Correspondence.

"Audi alteram partem."

A HOME MEDICAL SERVICE FOR THE TREATMENT OF SOLDIERS.

To the Editor of THE LANCET.

SIR,—In a leading article in your issue of Jan. 13th, referring to a proposal that greater use should be made of the part-time services of civilian doctors for the treatment of sick and wounded soldiers in this country, you say (p. 68): "We believe that in this way an economy of personnel could be effected, and more medical men found to meet the demands of the Director-General of the Army Medical Service."

I am confident that your belief is as well founded as it is widely held by large numbers of men qualified to express an opinion on the question. At the same time you refer to the well-known difficulties attached to the proposal. I believe that these difficulties are only on the surface, and would disappear if they were boldly faced. There certainly should be no difficulty in obtaining men for this home service. A properly constituted authority set up by Government and empowered to offer a moderate remuneration for the work undertaken would at once be inundated with offers, not merely of part-time but of whole-time service, by medical men who on account of age, nationality, partial invalidity, or commitments to their civilian patients could not be regarded as eligible for commissions in the R.A.M.C. The difficulty here would merely be one of selecting those best fitted for the work by their professional attainments or most suitably situated locally to carry out together their hospital duties to the soldiers and their domiciliary duties to their civilian patients.

If the personnel of the constituted authority were properly chosen, not only could these tasks of selection be well performed, but the professional work to be carried out could be wisely allocated according to the type of practice, general, consultant, or specialist, in which the applicant had previously been engaged. With such a volunteer home service enrolled there should be no difficulty in providing from it an adequate staff for any hospitals already, or hereafter to be, established for the treatment of sick and wounded soldiers in this country. There are already numerous Red Cross and private hospitals for soldiers running smoothly and efficiently, which are staffed by men of the type who would constitute this service, the only difference being that these staffs have been individually appointed to these hospitals, and do not form part of any centralised service. The existence of a central controlling authority would promote efficiency and make it easy to meet any troubles that from time to time might arise, and to remove and replace an inefficient member of the staff.

Nor should any difficulty be found in arranging for members of this home service and members of the Royal Army Medical Corps to work side by side in hospitals in which this seemed a desirable plan. Civilian doctors without commissions, part-time civilian doctors with *à la suite* commissions, and R.A.M.C. officers are conjointly staffing many hospitals now. But if this is not thought desirable, some hospitals could be staffed entirely by the home service and others by the R.A.M.C. It should not be difficult for the authorities of the Army Medical Service to select the hospitals whose transference to home service staffs would set free the largest number of R.A.M.C. officers for duty abroad. There should be no difficulty in finding funds for the payment of this service or in fixing the remuneration of its members. The cost would certainly be considerably less than that of remunerating a corresponding number of commissioned officers. There would be no need to make provision for pensions.

If I have by chance unduly minimised the difficulty of solving some of the problems indicated above there can certainly be no doubt that they are collectively incomparably easier of solution than is the problem of providing additional medical men for the Army, without dangerous depletion of the medical services of the civilian population, by any other means than by the greater use of the part-time services of civilian doctors for the treatment of soldiers. Perhaps, however, the difficulty you, Sir, have in mind is that of persuading the Government that this step is necessary or of securing the cordial coöperation of the authorities of the Army Medical Service. If so, I venture to think that again these difficulties are exaggerated. The Government is now thoroughly alive to the fact that the war is not to be won by the fighting forces alone, but that the needs of munition workers and food producers must also be considered. The War Office, too, is learning to accept gratefully any relief from responsibilities which can be safely entrusted to others.

With the powerful assistance of the medical press there should be no insuperable difficulty in persuading the Cabinet of the urgent need of the prompt establishment of a home medical service for the hospital treatment of sick and wounded soldiers in this country.

I am, Sir, yours faithfully,

London, N.W., Jan. 15th, 1917. LAURISTON E. SHAW.

THE DEFINITION OF ACUTE ALCOHOLISM.

To the Editor of THE LANCET.

SIR,—In a letter in your issue of Jan. 13th Dr. Chalmers Watson draws attention to the curious fact that, while drunkenness amongst women in Edinburgh, as measured by the police returns, decreased materially last year, there was at the same time a large increase in the number of female patients admitted to the Royal Infirmary suffering from "acute alcoholism." It would be interesting, and might, perhaps, help towards the explanation of this apparent paradox, if Dr. Watson would indicate whether there has been an alteration in the type as well as in the number of the cases included under this latter heading—whether, for instance, cases of delirium tremens have increased in the same proportion as the other conditions grouped with it under the general denomination of "acute alcoholism." Amongst the various suggested indices of excessive drinking statistics of delirium tremens have the very decided advantage that they refer to a tolerably well-defined and easily recognisable clinical condition, and are, therefore, less liable to disturbing influences arising from the differing judgments and points of view of different observers. The official returns published in the daily press show that statistics of this disease have been found to be a useful and reliable means of gauging alcoholism in England; it would be in accordance with accepted medical views to anticipate that they would be even more valuable in Scotland, where spirits are the predominant form of alcoholic beverage.—I am, Sir, yours faithfully,

London, Jan. 17th, 1917. W. C. SULLIVAN, M.D. R.U.I.

DENTAL SURGERY AND INJURIES OF THE JAW.

To the Editor of THE LANCET.

SIR,—In the Annus Medicus of your issue of Dec. 30th the treatment of war injuries of the jaws was discussed under the heading of Dental Surgery. This raises an important question—the question of personnel. The principles to be observed in the treatment of fractures are fundamentally the same whatever bone be involved. The end in view is the attainment of firm union without deformity and without loss of function. The means to be employed will be largely determined by anatomical factors. It is as regards this anatomical factor only that a fractured jaw differs from a fractured femur. The means to the desired end may briefly be classified as mechanical and surgical, used more particularly in the narrower sense of operative. The dental surgeon is fitted by his training and experience to devise and construct mechanical apparatus for the efficient and accurate retention of fractured fragments in their normal positions. In the simpler forms of fracture, by the employment of such means as his daily work has made him familiar with, he may attain good results and may rightly be charged with the sole responsibility for the conduct of the case. A great number of the fractures occasioned during this war have not been, and will not be, of this simpler type. Comminution, loss of bony substance, laceration and loss of soft parts are only too frequent. In the presence of these complicating factors the dental surgeon must necessarily feel himself at a loss. There is nothing in his previous experience to guide him; he is

unacquainted with the behaviour of analogous lesions in other parts of the body. Left to himself, he utilises, and rightly so, only such methods as he feels conscientiously entitled to employ. My contention is that these methods are totally inadequate for the efficient treatment of complicated cases. Most dental surgeons will readily grant the truth of this contention, and would only too gladly welcome active coöperation and collaboration with their respective surgeons. The attitude of surgery in this matter has exhibited a tendency to two extremes. In the early days of the war the dental surgeon was ignored; it is now becoming more and more customary for surgeons to refer jaw injuries to the unassisted care of the dentist. The results under the former system were almost consistently bad; the results under the latter system are likely to be equally unsatisfactory as regards these severer types of injury. Surgical conditions should be dealt with by surgeons. War injuries of the jaw should no more be treated by dental surgeons alone than should the treatment of such injuries be discussed exclusively under the head of dental surgery.

Active collaboration between surgeon and dentist makes for the good of the patient and for progress, and until such time as the importance of this is universally recognised and acted upon so long will discreditable failures continue to occur.

I am, Sir, yours faithfully,

Queen Anne-street, W., Jan. 12th, 1917. PERCIVAL P. COLE.

THE PHENOMENA OF ANAPHYLAXIS.

To the Editor of THE LANCET.

SIR,—As it does not seem to be generally known, it may be of use to point out that after serum injections anaphylactic symptoms coming on at once and serum rashes coming on after an interval are rapidly controlled by subcutaneous injections of pituitrin. In anaphylaxis 1 c.c. given at once relieves the collapse and spasm of the bronchioles within a few minutes. The dose should be repeated if the symptoms show any sign of returning. A similar plan is equally successful in serum rashes.

I am, Sir, yours faithfully,

W. M CROFTON, M.D. N.U.I.

Laboratory of Special Pathology, University College, Dublin, Jan. 14th, 1917.

THE NOMENCLATURE OF "INTERNAL SECRETION."

To the Editor of THE LANCET.

SIR,—I hope and think that on reflection Sir Edward Schäfer will regret the arrogant tone he adopted in his letter in your issue of Jan. 13th concerning the nomenclature of "Internal Secretion." It is quite unworthy of his high position. I regret extremely that, in the circumstances he has created, an effective answer must necessarily contain a few remarks that will perhaps increase his displeasure. I hasten to apologise in advance, for controversy is better carried on in a spirit of mutual consideration.

To deal first with the last sentence in his letter. Professor Schäfer asserts, "I have at least as good a right as Dr. Blair Bell to suggest an appropriate nomenclature for what is after all to some extent my own progeny." With regard to the "right" he claims, I am sure no one will deny that everyone who has worked at the subject has an equal right in this matter. I have never hinted anything to the contrary. As to the assertion that the internal secretions are the progeny of Sir Edward Schäfer—well, I hardly know what to say; it seems unnecessary to say anything, so common is the knowledge that they were brought into existence long before Sir Edward Schäfer was born. If by "to some extent" he means to pay a well-deserved tribute to the numerous able collaborators with whom he has worked, why put it in such a back-handed and vainglorious manner? If by this qualification he means that he has helped to wash and nurse a lusty infant, I am sure all will agree that he has done well in the matter; but even this does not give him the right to claim the offspring as his own.

Now as to the subject under discussion. Let me say at once that I do not think my remarks regarding Sir Edward Schäfer's terminology can be described as "censure"—that is a strong term, and one which implies far more than could be extracted from my words. Besides, if he will look again at my letter he will find that I do not, as he states, attribute the word "endocrine" to him. I am glad, however, that he tacitly admits that "endocrine" is a badly formed word. Indeed, it would hardly be a greater classical crime to make it mean "internal hair" instead of the present interpretation. This being so, I am surprised that one who later on tries to trip me up on a somewhat similar point, should demand its perpetuation.

With regard to Sir Edward Schäfer's objection to my suggested terms "hormopoietic" and "hormopoiesis," I have already said I do not approve of "endocritic," even though my sense of correct word-formation has compelled me to use it in the past in preference to "endocrine." I think that all will admit that "hormopoiesis" is more euphonious than "hormonpoiesis," which at first I thought of suggesting; and I think that there are plenty of instances to be found of such shortening—for example, "autacoid." I take it that for philological purposes the root "horm-" is the one common to the noun "hormone" and the verb from which it was derived; but by all means make the word "hormonpoiesis" if it will help the uninitiated. Further, I am afraid I must accuse Sir Edward Schäfer of having no imagination, for a very little would have shown him that even if the root "horm-" were derived from ὅρμος it would not be inappropriate, for do not the hormones connect—link up—the tissues of the body; Q.E.D., as Euclid used to say. Again, I must emphasise the fact that it would be an untold advantage, especially to students, to have some direct sequence in our terminology of the subject.

With regard to the complaint of my "following most authors" and limiting the term "hormone," perhaps the following statements from my Arris and Gale lectures may make quite clear my position, which, oddly enough, appears to be even less limited than that of Sir Edward Schäfer: "It is probable that every cell in the body is a ductless gland, and has some influence on the life and functions of the rest. ..... The aggregations of specialised cells for the regulation of the body metabolism, which are known as the ductless glands ....."[1] Further, I can assure Sir Edward Schäfer that I am quite familiar with his own small work on "The Endocrine Organs" and with the classical paper of Bayliss and Starling to which he refers in his book and letter. Unfortunately, I am too well acquainted with the paper of Bayliss and Starling for Sir Edward Schäfer's comfort, for had he been as well acquainted with it as he professes he would have avoided a mistake, of which, judging from the tone of his letter, he is incapable. There is no mention of the word "hormone" or of the term "chemical messenger" in this paper. Since there are only about a dozen references in the whole volume such a mistake is inexcusable, and to make capital of it against me is ludicrous.

I have already said that there is nothing against the words "chalone" and "autacoid" as verbal trills, but they are superfluous, and tend to burden the nomenclature of the subject. But to say that the provocation or production of inhibition—Sir Edward Schäfer calls it "provoking prevention"—is a contradiction in terms is singularly unfortunate. Here, too, a little imagination would probably have brought as much understanding as is possible in regard to inhibition produced by hormones—a phenomenon, indeed, which is little understood, even if it be admitted.

I am, Sir, yours faithfully,

Liverpool, Jan. 14th, 1917. W. BLAIR BELL.

THE LIQUOR TRAFFIC AND THE FOOD QUESTION.

To the Editor of THE LANCET.

SIR,—There is no magic, necessarily, in State control—only wise enactments thereafter would achieve the avowed object. My point is that such legislation, if carefully thought out and really sane and practicable, can just as well be applied without purchase of the Drink Interest as with it. This is most important from the point of view of husbanding the nation's finances and avoiding the colossal addition to the National Debt which purchase would mean.

I am, Sir, yours faithfully,

Whitehall Court, S.W., Jan. 13th, 1917. HENRY CURTIS.

[1] THE LANCET, 1913, i., 937.

The War.

THE CASUALTY LIST.

THE following names of medical officers appear among the casualties announced since our last issue :—

Wounded.

Capt. J. Crawford, R.A.M.C.
Capt. D. W. F. Jones, R.A.M.C., attached King's Royal Rifle Corps.

DEATHS AMONG THE SONS OF MEDICAL MEN.

The following son of a medical man must be added to our lists of those who have fallen during the war :—

Second Lieut. C. S. Dalziel, Durham Light Infantry, youngest son of Dr. W. Dalziel, of South Shields.

THE HONOURS LIST.

The following awards to medical officers are announced :—

Military Cross.

Capt. Edward James Blair, R.A.M.C.
For conspicuous gallantry and devotion to duty. He tended and dressed the wounded under heavy fire continuously for 18 hours. He set a splendid example of courage and determination throughout.

Capt. Hawtrey William Browne, R.A.M.C.
For conspicuous gallantry and devotion to duty. He made a tour of five regimental aid posts under very heavy fire and carried in many wounded men. He set a splendid example throughout.

Temp. Capt. William George Thomas Hepplewhite, R.A.M.C.
For conspicuous gallantry and devotion to duty. He worked unceasingly day and night supervising his bearers, clearing the wounded under very heavy fire. He set a splendid example throughout.

Temp. Capt. Herbert Bruce Low, R.A.M.C.
For conspicuous gallantry and devotion to duty. He dressed the wounded and supervised the work of the bearers under very heavy fire. He set a splendid example of courage and coolness throughout.

Capt. John Wright Malcolm, R.A.M.C., Spec. Res.
For conspicuous gallantry and devotion to duty. He displayed great courage and determination in constantly directing bearer squads under heavy fire. On another occasion he rescued several men who were buried.

Temp. Capt. Victor Harold Mason, R.A.M.C., East Yorks Regiment.
For conspicuous gallantry and devotion to duty. He displayed great courage and determination in tending and dressing the wounded under very heavy fire.

Temp. Capt. Lloyd Remington Meech, R.A.M.C.
For conspicuous gallantry and devotion to duty. He worked continuously for 48 hours collecting wounded under very heavy fire. He set a splendid example throughout.

Temp. Lieut. Alexander Gordon Peter, R.A.M.C.
For conspicuous gallantry and devotion to duty. He tended and dressed the wounded under very heavy fire, displaying great courage and determination throughout.

Temp. Lieut. Albert Edward Sutton, R.A.M.C.
For conspicuous gallantry and devotion to duty. He displayed great courage and determination in tending the wounded under heavy fire. He worked single-handed all night in an advanced post.

Temp. Capt. Harold Ernest Pierpoint Yorke, R.A.M.C.
For conspicuous gallantry and devotion to duty. He displayed great courage and determination in tending the wounded under very heavy fire. Later, although himself wounded, he continued to carry out his work.

Capt. William Malloch Hart, Canadian A.M.C.
For conspicuous gallantry and devotion to duty. He displayed great courage and skill in evacuating wounded under most trying conditions. On one occasion he worked for several hours in the open under heavy fire attending to the wounded. He has previously done fine work.

Capt. Tom Welsh, S. African Med. C., attached South African Infantry.
For conspicuous gallantry and devotion to duty. He displayed great courage and determination in organising and leading stretcher parties under very heavy fire.

It is officially announced that the name of Capt. Robert Burgess, R.A.M.C., is to be deleted from the list of those to whom the Military Cross is awarded (THE LANCET, Jan. 6th, 1917, p. 38).

A SUPPLY depôt for the St. John Ambulance Brigade has been opened at Halkyn House, Belgrave-square, S.W.

OBITUARY OF THE WAR.

ERNEST HOWE, M.B., CH.B. VICT.,
LIEUTENANT, ROYAL ARMY MEDICAL CORPS.

Lieutenant E. Howe, who died last month of wounds contracted on active service, was 30 years of age. He received his medical training at the Owens College, Manchester, and Manchester Royal Infirmary, graduating M.B., Ch.B. of Victoria University in 1909. After holding the appointment of house physician at Manchester Royal Infirmary he settled in practice at Hazel Grove, near Stockport, until the need for medical officers in the R.A.M.C. became pressing, when he applied for a commission, which he obtained in October, 1916. He was sent out to Salonica and was resting after taking his turn in the trenches when he was wounded in several places by fragments of shell during an air raid.

One portion penetrated the chest and death rapidly resulted from shock. Lieutenant Howe had not practised long in Hazel Grove, but had already, by his devotion to work and consideration for others, established himself in the esteem of his patients and professional colleagues. He leaves a widow and two young children.

BENJAMIN RICHARD ROBERTS, L.R.C.P. & S. EDIN., L.F.P.S. GLASG.,
LIEUTENANT, ROYAL ARMY MEDICAL CORPS.

Lieutenant B. R. Roberts, who was killed in action in France early in August last, was educated at Queen's College, Galway, and at the Royal College of Surgeons, Edinburgh, where he took the triple qualification of the Scottish Colleges in 1898. Three years later he went out as civil surgeon attached to the R.A.M.C., serving in this capacity during the Anglo-Boer War. Shortly after the declaration of peace in 1902 he was appointed acting district surgeon at Barberton, and subsequently medical officer in charge of the native refugee camps at Kroonstad and Vereeniging. In November, 1903, he joined the medical staff of the Central South African Railways in the Orange River Colony, and in the following year was sent to Johannesburg as additional railway medical officer, a post which he filled until early in 1916, when he volunteered for active service in France. His death was due to a shell explosion, and was instantaneous. The news of Lieutenant Roberts's death came as a great shock to the many railway men who had known him, and amongst whom his genial kindliness and skill made him deservedly popular. He took a keen interest in Volunteer work, and was for years medical officer to the Railway Volunteer Engineering Corps as it then existed. Lieutenant Roberts leaves a widow and two young sons, with whom much sympathy is felt.

THE CENTRAL MEDICAL WAR COMMITTEE.

At a meeting of the Central Medical War Committee held on Wednesday afternoon last it was decided to join with the Committee of Reference of the English Royal Colleges and the Scottish Medical Services Emergency Committee in submitting a memorandum to the Director of Public Services on the subject of the organisation of the whole of the medical profession for the purposes of the war and of the existing national circumstances, and asking for an early interview.

THE SUPPLY OF KNITTED ARTICLES FOR THE FORCES.

The supply of sweaters and other knitted articles absolutely needed for the comfort of the men in the Navy and Army is running short, not probably through a decrease of effort so much as because the numbers to be supplied have happily much increased. In these circumstances we call the attention of our readers to the following letter which we received last week from Mr. John Penoyre, 8, King's Bench-walk, Inner Temple, London, E.C. :—

It has been my good fortune to transmit to the men in the field some 32,000 sweaters since the war broke out. Sir Edward Ward, the Director-General of Voluntary Associations, now asks if, without letting the sweater industry go down, I could "do the same for the men's mufflers, of which a very great quantity are wanted at once." The sweater pattern, easy and economical, is to be had here for asking, but the W.O. formula for mufflers is so short that I hope you may find room for it at once. The muffler should measure 58 in. by 10 in. and be made on two No. 7 needles, taking 10 oz. of fairly thick drab or khaki wool. One knows of the enormous amount of well-considered work that has been done for the men all over the country. I feel, however, that one has but to name the incredible numbers that our armies have recently reached to justify asking this further effort. I am authorised, then, to state that the need for sweaters, mufflers, and all other hall-marked comforts is great and immediate, and that these should be sent either to the Voluntary Organisations Depôts throughout the country, or to the D.G.V.O.'s Depôt at 45, Horseferry-road, S.W., or to me as above.

When any of our readers are confronted with patients or the friends of patients whose time is not fully occupied it will be useful to bring Mr. Penoyre's movement before them.

THE EDITH CAVELL HOMES OF REST FOR NURSES.

—Lieutenant-Colonel Sir Richard C. Temple, as chairman of the council for the institution of these homes, recently drew attention to the fact that the officers of H.M.H.S. *Britannic*, then about to proceed to the Near East, had offered voluntarily to make a collection for the homes. Soon afterwards the *Britannic* was torpedoed and some of the staff lost, but the following letter from Captain H. Slater, R.A.M.C., to Sir Richard Temple shows the interest taken by the nursing sisters and medical staff on board :—

St. Brideaux, Devonport.

DEAR SIR,—There was collected on H.S. *Britannic* the sum of £13 15*s.* 1*d.* ; of this I placed £9 8*s.* 7*d.* in charge of the Purser, and it went down with the ship, but I hope to get this refunded. In the meantime, I send you my cheque for the balance, £4 6*s.* 6*d.* I may say that we had hoped to collect £30, and no doubt we should have done so except for our unfortunate misadventure. A very general interest was shown in the proposed homes by the nursing sisters and the troops of the R.A.M.C. Our most energetic collector was Lieutenant J. Cropper, R.A.M.C., who lost his life, being cut to pieces by a propeller.

The example of the staff of the ill-fated *Britannic* in respect of the Edith Cavell Homes is one that we hope may be widely followed.

THE NEW ONTARIO MILITARY HOSPITAL.—The opening of the new Ontario Military Hospital at Coburg, Ont., in what was once Victoria College, the forerunner of Victoria University, Toronto, is fresh evidence of the enterprise of the Ontario Government for the welfare of returned soldiers. The hospital has been established by the Ontario Government for the treatment of returned soldiers who are suffering from mental disease due to shell shock or other causes, and is under the supervision of the Canadian Hospitals Commission. Dr. F. S. Vrooman, of the Brockville Hospital for the Insane, is medical superintendent, and the other members of the staff have been drawn from institutions in the province. The hospital is equipped with continuous baths, radiant-light and radiant-heat cabinets, electric baths, Scotch douche, needle, shower, and sitz baths, and has accommodation for 150 patients, although only 70 beds are occupied at present. So far some 40 per cent. of the cases have been discharged cured or much improved, others have been removed to institutions for permanent care. The hospital is claimed to be the first of its kind in the Empire outside the British Isles.

HEALTH OF THE GERMAN ARMY.—A wireless message from the Berlin Admiralty gives health statistics for the German Army during the second year of war. The message states that small-pox was non-existent, typhoid had diminished by three-quarters, dysentery and cholera by one-third. The incidence of phthisis and pneumonia had sunk to about one-half. Of the wounded, 70 per cent. returned to the front and 6 per cent. were unfit for further military service. The mortality in the base military hospitals amounted to 1 per cent. The total number of soldiers blinded during the war was 1250.

Medical News.

EXAMINING BOARD IN ENGLAND BY THE ROYAL COLLEGES OF PHYSICIANS OF LONDON AND SURGEONS OF ENGLAND.—At the quarterly examination in Practical Pharmacy held on Jan. 11th the following candidates were successful :—

Hector Demetrius Apergis, Guy's Hospital; Edwin Alfred Clegg, Middlesex Hospital; Alan Andreas Cockayne, Cambridge University and St. Thomas's Hospital; William Arnold Clements, Birmingham University; Arnold Edgar Collie, Cambridge University and Middlesex Hospital; Ernest James Coombe, St. George's Hospital; Cecil Lucas Donne, Middlesex Hospital; Saad El Din Ahmed El Daab, Cairo and St. Bartholomew's Hospital; Armin Frank Fuoss, Birmingham University; Lawrence Gill, Guy's Hospital; Sydney Limbery Higgs, Cambridge University and St. Bartholomew's Hospital; Joseph Christopher Campbell Howe, Guy's Hospital; Leslie Clifford Moore, Liverpool University and St. Thomas's Hospital; Graham Murray-Sh rreff, private study; Sydney Watson Page, Cambridge University and St. Bartholomew's Hospital; Maurice Pearson, Guy's Hospital; Rupert Idris Rhys, University College, Cardiff, and St. Bartholomew's Hospital; Lewis Henry Douglas Thornton, Cambridge University and Middlesex Hospital; William Stephen Tunbridge, Oxford University and St. Bartholomew's Hospital; Herman Crowther Viehoff, Liverpool University; William Harold White, St. Thomas's Hospital; Catherine Mabel Williams, London School of Medicine for Women; and Vyvian Deane Wyborn, Charing Cross Hospital.

LETTERKENNY MEDICAL OFFICERSHIP.—Our Belfast correspondent writes: Nowhere but in Ireland could such extraordinary topsy-turvy situations arise as have occurred in relation to the medical officership of Letterkenny Dispensary. At a meeting of the board of guardians, held on Jan. 12th, the political party which was previously in the minority found themselves by mere chance in the majority, with the result that the account of Mr. T. Patterson for £5 8*s.* for acting as locum-tenent for Dr. J. P. McGinley during the latter's absence at the winter assizes was refused, on the grounds that the Local Government Board had not sanctioned the appointment of either of these medical men. Dr. W. N. Walker's bill, for acting as temporary medical officer (he having been recognised by the Local Government Board) was ordered to be paid, the amount being £79 9*s.* 10*d.* Finally the items on the pay-sheet for Dr. McGinley were refused to be sanctioned for payment, on the grounds that his appointment had not been sanctioned by the Local Government Board.

ROYAL INSTITUTE OF PUBLIC HEALTH.—A course of lectures is being delivered under the auspices of this Institute dealing with public health problems under war and after the war conditions. The lectures are delivered on the Wednesdays of January, February, and March at the lecture room of the Institute, 37, Russell-square, London, at 4 P.M., and the delivery of the first two by Miss Janet Lane-Claypon, M.D., and Mrs. Scharlieb, M.D., respectively, have already been announced. The lectures still to come are as follows:—Jan. 31st: Dr. Chas. John Macalister on the Prevention and Arrest of Venereal Disease in Men. Feb. 7th: Lady Barrett, M.D., on the Rôle of the Midwife and the Protection of Motherhood. Feb. 14th: Lieutenant-Colonel S. A. M. Copeman, M.D., F.R.S., on the Prevention and Arrest of Infectious Disease in War-time. Feb. 21st: Dr. T. D. Lister on the Tuberculosis Problem in War-time. Feb. 28th: Dr. W. G. Savage on the Protection of the Milk-supply. March 7th: Professor F. G. Hopkins, F.R.S., on the Selection and Preparation of Foods in War-time. March 14th: Dr. E. L. Collis on the Protection of the Health of Munition Workers. March 21st: Professor Sir Thomas Oliver, F.R.S., on the Hygiene of Occupation in War-time. March 28th: Lieutenant-Colonel Sir A. Pearce

Gould, K.C.V.O., on Personal Habits in Relation to Public Health in Time of War. Prominent workers in connexion with the various different subjects have promised to be present at the lectures and to take part in any discussion which arises.

THE gross takings of a disorderly house in Torrington-square were stated, at a prosecution at Bow-street police-court this week, to be at the rate of over £6000 a year.

THE Home Secretary has extended until Feb. 28th the time during which unregistered dentists may purchase preparations containing not more than 1 per cent. of cocaine.

THE National Institute of Mothercraft has received an anonymous donation of £5000 to equip and maintain its ante-natal clinic.

Appointments.

Successful applicants for vacancies, Secretaries of Public Institutions, and others possessing information suitable for this column, are invited to forward to THE LANCET *Office, directed to the Sub-Editor, not later than 9 o'clock on the Thursday morning of each week, such information for gratuitous publication.*

DOUBLEDAY, F. N., L.R.C.P., M.R.C.S., L.D.S. Eng., has been appointed Dental Surgeon to King George Military Hospital.

ROBERTS, A., M.D. St. And., Certifying Surgeon under the Factory and Workshop Acts for the Harrogate District of the County of Yorks, West Riding.

ROSS, E. H., M.R.C.S., L.R.C.P. Lond., to be Certifying Surgeon under the Factory and Workshop Acts for the City of London.

Vacancies.

For further information regarding each vacancy reference should be made to the advertisement (see Index).
When the application of a Belgian medical man would be considered the advertisers are requested to communicate with the Editor.

BIRKENHEAD UNION INFIRMARY.—Junior Female Resident Assistant Medical Officer. Salary at the rate of £250 per annum, with board, &c.

BIRMINGHAM CITY.—Female Doctor for Infant Welfare Work. Salary £350 per annum.

BIRMINGHAM CITY EDUCATION COMMITTEE.—Temporary Assistant School Medical Officer. Salary £300 per annum.

BOLTON INFIRMARY AND DISPENSARY.—Female Second House Surgeon. Also Female Third House Surgeon. Salaries £200 and £180 per annum, respectively, with board, &c.

BRADFORD ROYAL INFIRMARY.—Medical Officer in Charge of Out-patients. Salary at rate of £250 per annum. Also Female Medical Officer for Out-patients. Salary £125 per annum.

BRISTOL GENERAL HOSPITAL.—House Surgeon for six months. Salary at rate of £175 per annum, with board, &c.

CAMBRIDGE, ADDENBROOKES HOSPITAL.—Honorary Assistant Surgeon in Out-patients' Department.

CHESTERFIELD AND NORTH DERBYSHIRE HOSPITAL.—Second House Surgeon. Salary £150 per annum, with board, &c.

COVENTRY EDUCATION COMMITTEE.—Temporary Assistant School Officer. Salary £350 per annum.

DUMFRIES, CRICHTON ROYAL.—Temporary Pathologist and Clinical Pathologist, unmarried. Salary £300 per annum, with board, &c.

GRIMSBY AND DISTRICT HOSPITAL.—House Surgeon. Salary £5 5s. per week, with board, &c.

HARROGATE INFIRMARY.—Resident House Surgeon.

HOSPITAL FOR CONSUMPTION AND DISEASES OF THE CHEST, Brompton.—House Physician for six months. Salary 30 guineas.

HOSPITAL FOR SICK CHILDREN, Great Ormond-street, London, W.C.—House Surgeons, Assistant Casualty Medical Officer, and House Physician, unmarried. Salary at rate of £60 per annum each, with board, &c.

KENSINGTON BOARD OF GUARDIANS WORKHOUSE AND INFIRMARY.—Second Assistant Resident Medical Officer. Salary £160 per annum, with board, &c.

LEAMINGTON SPA, WARNEFORD GENERAL HOSPITAL.—Junior Resident Medical Officer. Salary £150 per annum, with board, &c.

LEEDS GENERAL INFIRMARY.—Resident Aural Officer. Salary £100 per annum, with board, &c. Also Ophthalmic House Surgeon. Salary £50 per annum, with board, &c.

LEICESTER CORPORATION.—Female Second Resident Medical Officer for Isolation Hospital and Sanatorium, Groby-road. Salary at rate of £250 per annum, with board, &c.

LISCARD, WALLASEY, VICTORIA CENTRAL HOSPITAL.—House Surgeon. Salary £250 per annum.

NEWCASTLE-UPON TYNE, ROYAL VICTORIA INFIRMARY.—Female Assistant in Venereal Diseases Department.

NORTHUMBERLAND CHILDREN'S CONSUMPTIVE SANATORIUM, Stannington.—Female Resident Medical Officer. Salary £200 per annum, with board, &c.

NOTTINGHAM AND MIDLAND EYE INFIRMARY.—Female House Surgeon. Salary £120 per annum.

PLAISTOW HOSPITAL FOR INFECTIOUS DISEASES, London, E.—Temporary Resident Medical Officer. Salary at rate of £250 per annum, and all found.

QUEEN MARY'S HOSPITAL FOR THE EAST-END, Stratford.—House Surgeon.

ROCHESTER, ST. BARTHOLOMEW'S HOSPITAL.—Clinical Assistant. Salary at rate of £110 per annum, with board, &c.

ST. GEORGE'S HOSPITAL, Hyde Park Corner, S.W.—Surgical Registrar. Salary £200 per annum, with board, &c.

ST. MARK'S HOSPITAL, City-road, E.C.—House Surgeon.

ST. PANCRAS DISPENSARY, 39, Oakley-square, W.—Resident Medical Officer. Salary £150 per annum, with residence, &c.

SCOTLAND, NAVAL AUXILIARY HOSPITAL.—Assistant Surgeon and Medical Officer. Salary £1 per day, with board, &c.

SHEFFIELD ROYAL HOSPITAL.—Assistant House Surgeon, unmarried. Salary £120 per annum, with board, &c.

SOUTHAMPTON PARISH INFIRMARY, Shirley Warren.—Resident Assistant Medical Officer. Salary £250 per annum, with board, &c.

STAFFORDSHIRE, WOLVERHAMPTON, AND DUDLEY JOINT COMMITTEE FOR TUBERCULOSIS, MOXLEY SANATORIUM, near Wednesbury, Staffs.—Resident Medical Officer. Salary £350 per annum, with board, &c.

SUNDERLAND ROYAL INFIRMARY.—Female House Surgeon. Salary £150 per annum, with board, &c.

UNIVERSITY OF LONDON.—External Examiners.

VICTORIA HOSPITAL FOR CHILDREN, Tite-street, Chelsea, S.W.—House Surgeon for six months. Salary at rate of £200 per annum, with board, &c.

WIGAN, ROYAL ALBERT EDWARD INFIRMARY AND DISPENSARY.—Resident Surgical Dresser.

WORCESTER, CITY OF.—Female Temporary Assistant Medical Officer. Salary £350 per annum.

THE Chief Inspector of Factories, Home Office, London, S.W., gives notice of a vacancy for a Certifying Surgeon under the Factory and Workshop Acts at Amlwch, Anglesey.

Births, Marriages, and Deaths.

BIRTHS.

MAXWELL.—On Jan. 3rd, at Prince's gate, W., the wife of Lieutenant H. B. Maxwell, R.A.M.C., of a son.

ROBIN.—On Jan. 2nd, at Sidmouth, the wife of Arthur Robin, M.D., of a son.

WILSON.—On Jan. 10th, at Harley-street, W., the wife of Dr. S. A. Kinnier Wilson, of a son.

YOUNG.—On Jan. 10th, at Inverness-gardens, Kensington, the wife of Captain (Temporary) F. P. Young, R.A.M.C., of a daughter.

MARRIAGES.

BURD—WALKER.—On Jan. 8th, at All Saints, Bournemouth E., Lycett Burd, M.D. Cantab., to Elizabeth, daughter of the late E. V. Walker, Dewsbury.

COLLEDGE—BRACKENBURY.—On Jan. 15th, at St. Stephen's Church, Hampstead, Lionel Colledge, Captain, R.A.M.C., to Margaret Mary, eldest daughter of Admiral J. W. Brackenbury, C.B., C.M.G., and Mrs. Brackenbury, of Belsize-square, Hampstead.

HART—PEARSON.—On Jan. 9th, at St. Barnabas Church, Addison-road, W., William Malloch Hart, M.C., C.A.M.C., to Mary Dorothy, only daughter of E. W. Pearson, of the Inner Temple, Barrister-at-Law, and Mrs. Pearson.

HOFFMAN—WENDEN.—On Jan. 6th, at Dursley Parish Church, Geoffrey Arthur Hoffman, M.B., to Mary, eldest daughter of Major Wenden, V.D., "The Chantry," Dursley.

LESLIE—LUPTON.—On Jan. 13th, at Essex Church, Kensington, Captain William Leslie, R.A.M.C., to Mary Beatrice, third daughter of Henry Lupton, of Torquay.

WEAVER—SIPPE.—On Jan. 9th, at St. Paul's, Portman-square, L. Bargrave Weaver, L.D.S. Eng., to Esther, youngest daughter of Mr. and Mrs. Charles H. Sippe, of Beckenham, Kent.

DEATHS.

BROWN (Chester-le Street).—At 4, Red Rose-terrace, on the 9th inst., William James, son of the late James Brown, of Dublin, and dearly beloved husband of Frances Ann Brown, daughter of the late Dr. Paul Maude Edger, of Hartlepool. Born at Dublin Feb 21st, 1849. Educated at Professor Graham Bell's School, Dublin, Bishop Stortford Collegiate School, Herts, and Institution Berchoud Asnières, near Paris; B.A., M.B. Dublin; L.R.C.S.I.; L. Med.; L.M.I.D., T.C.D., and L.M., Rotunda Hospital, Dublin; Certifying Factory Surgeon; late Surgeon-Captain 4th D. L.I.; late Surgeon to the Chester-le Street Ironworks; Examiner for Army and Militia recruits; late Medical Officer to Newcastle on Tyne Borough Lunatic Asylum; late House Surgeon and Secretary to the Hartlepools Hospital; contributor to the *British Medical Journal*, *Lancet*, and *Journal of Medical Science*; Past Master of the Earl of Durham Lodge of Freemasons, P.P.G.P. Grand Provincial Lodge, Durham, and a member of the Royal Arch Chapter of Concord.

FLOWER.—On Jan. 14th, at Boscombe, Hants, Frederick Isaac Flower, M.R.C.S., L.R.C.P., formerly of Warminster, Wilts, in his 75th year.

GOWANS.—On Jan. 15th, at Broughty Ferry, Dundee, James Gowans, M.B., C.M.

HAMILL.—On Jan. 7th, at Clowes House, Higher Broughton, Manchester, Dr. J. Wilson Hamill.

MORRIS.—On Jan 6th, at Parkside, Feltham, Middlesex, Colin Dwight Morris, M.R.C.S., L.R.C.P., L.S.A., aged 58.

MUNRO SMITH.—On Jan. 13th, at Apsley road, Clifton, Bristol, George Munro Smith, M.D., L.R.C.P. Lond., M.R.C.S., Hon. and Consulting Surgeon to the Bristol Royal Infirmary, late Lt.-Colonel R.A.M.C. (T.).

SANSOM.—On Jan. 9th, at West End-lane, West Hampstead, Harry Arthur Sansom, M.D., aged 53.

WELCH.—On Jan. 11th, at Blenheim-gardens, Cricklewood, John Welch, M.D., aged 92.

N.B.—A fee of 5s. is charged for the insertion of Notices of Births, Marriages, and Deaths.

Notes, Short Comments, and Answers to Correspondents.

THE EARLY TREATMENT OF GUNSHOT WOUNDS.

IN the *Quarterly Review* for October, 1916, Dr. Charles Singer published an interesting article under this title, accompanied by four pages of illustrations depicting (1) "An instrument for straightening a stiff and contracted joint"; (2) "Cauterising a wound" (both from Gersdorff, 1517); (3) "Ambrose Paré, aged 75"; and (4) (*a*) "The stork-beak wound dilator," (*b*) the "Alphonsinum" (a sort of "porte-crayon" bullet extractor, named after Alphonso Ferri, 1515–95), and (*c*) Paré's artery forceps. Eight books on the history of medicine are chiefly referred to—viz.: Brunschwig 1497, Giovanni de Vigo 1514, Hans von Gersdorff 1517, Conrad Gesner 1555, "Paré's Works" by J. F. Malgaigne 1840, Theodor Billroth 1859; "Ambrose Paré and his Times," by Stephen Paget, 1897; and the "History of Surgery," by E. J. Gurlt, 1898. In respect of the invention of gunpowder, Dr. Singer refers to the "semi-mythical German monk, Berthold the Black, about the year 1313." This is our old school hero, "Schwarz" anglicised, whose name was really, according to some authorities, "Konstantin Anklitzen," though most of us will always call him "Schwarz." Among other notables who cross Dr. Singer's stage may be mentioned the fourteenth-century Czech general, John Ziska, who became blind without resigning his command, and Matthias Corvinus (d. 1490), King of Hungary, who was a son of "Hunjadi Janos," whose name is familiar to many, having been borrowed for an aperient water years ago. Bartolomeo Maggi (d. 1552), a Bolognese military surgeon, and Leonardo Botallo, a Piedmontese anatomist (fl. *circa* 1550), and their support of some of Paré's doctrines on gunshot wounds are referred to, as well as Laurent Joubert (1529–83), Paré's most influential supporter, and Felix Wirtz (1514–74) of Basel, a Swiss and friend of Conrad Gesner. Wirtz was much praised by Billroth and other German writers. In conclusion, the level of surgery in England during the sixteenth century is discussed and the names of Thomas Gale (1507–87) and William Clowes the elder (1540–1604) are mentioned, with a quotation from the latter's work published in 1588: "A prooved practise for all young Chirurgions, concerning burnings with Gunpowder, & wounds made with Gunshot, Sword, Halbard, Pike, Launce or such other." Dr. Singer says that Clowes was a master of vituperative controversy. He writes very hardly of the "wicked brood of beastly abusers of Phisicke and Chirurgie, daylie more and more increasing to the utter undoing of many." We notice a double reference to "Heinrich von Pfolsprundt." Dr. Garrison in his "History of Medicine" spells this "Pfolspeundt." The date of Matthias Corvinus's birth is given in reference books as 1443 and not 1450. Maggi's year of birth is queried by Dr. Singer as "1477," Dr. Garrison states 1516; and the year of Ambrose Paré's birth, which Dr. Singer gives as 1510, has been given in many French and English books as 1517; but here there is some confusion probably.

VITAL STATISTICS OF GIBRALTAR.

THE Gibraltar Blue-book for 1915 gives the estimated civil population of the city and harbour as 8707 males and 9236 females—total 17,943, showing a decrease of 1643 as compared with the census of 1911. The births registered during the year numbered 368 and the deaths 330. The total number of patients treated in the Colonial Hospital was 784 and there were 59 deaths. Of 291 who underwent surgical operations, 7, or approximately 2 per cent., died. The number of out-patients treated was 7754. In the small-pox hospital 24 patients were treated, of whom two died. At the Tuberculosis Dispensary, under the management of the Sanitary Commissioners, the monthly attendance of patients for inspection and treatment during the year averaged 55·5. In the Tuberculosis Home, under the same management, 23 adults and 35 children were accommodated at different periods of the year. The number of patients visited at their homes by the medical officer of health averaged 30 each week; 11,396 lb. of beef and 22,905 pints of milk were distributed to patients during the year. There were 6 deaths in the Home from advanced tuberculosis. The daily average number of patients in the lunatic asylum was 34 (22 males and 12 females); there were three deaths. The mean maximum temperature for the year was 69·2 and the mean minimum 57·2. The rainfall was 53·2 inches, as against 36·75 in the previous year.

R.—We have no information on the subject. The scheme has not yet been before the Director of Public Services. We expect the working to be left, as our correspondent suggests, at least as long as the War Office is satisfied.

Medical Diary for the ensuing Week.

SOCIETIES.

ROYAL SOCIETY, Burlington House, London, W.

THURSDAY.—Papers:—Lord Rayleigh O.M.: On the Dynamics of Revolving Fluid.—Hon. R. J. Strutt: Spectroscopic Observations on the Active Modification of Nitrogen. V.—Prof. J. W. Nicholson and Prof. E. Wilson: Magnetic Induction and its Reversal in Spherical Iron Shells (communicated by Prof. J. A. Fleming).—Mr. S. Brodetsky: The Two dimensional Motion of a Plane Lamina in a Resisting Medium (communicated by Prof. G. C. Bryan).

ROYAL SOCIETY OF MEDICINE, 1, Wimpole-street, W.

MEETINGS OF SECTIONS.

Monday, Jan. 22nd.

ODONTOLOGY (Hon. Secretaries—F. R. Smyth, F. N. Doubleday, J. Howard Mummery): at 5.30 P.M.

Paper:

Dr. A. E. Rowlett: Conductive Anæsthesia of the Mandible.

N.B.—Members will please note the change of time to *5.30 p.m.*

Tuesday, Jan. 23rd.

MEDICINE, PATHOLOGY, EPIDEMIOLOGY: Combined Meeting: at 5 P.M.

Discussion:

"The Origin, Symptoms, Pathology, Treatment, and Prophylaxis of Toxic Jaundice observed in Munition Workers and Troops."

Surgeon-General H. D. Rolleston will take the chair, and the discussion will be opened by Dr. T. M. Legge, H.M. Medical Inspector of Factories.

PSYCHIATRY (Hon. Secretaries—Bernard Hart, G. F. Barham): at 4.30 P.M.

Communication:

Dr. F. Sano: Morphological Investigations upon the Convolutional Pattern of Relative Brains in Man.

N.B.—For the general convenience of members during the war, the Council has decided to hold the meetings of this Section at *4.30 p.m. instead of 8.30 p.m.*

Thursday, Jan. 25th.

BALNEOLOGY AND CLIMATOLOGY (Hon. Secretaries—Chas. W. Buckley, J. Campbell McClure): at 5.15 P.M.

Papers:

Dr. A. G. S. Mahomed: Distribution of Deaths from Lightning-stroke in England.

Dr. J. Horne Wilson: Galvanometric Diagnosis and Dielectric Therapy, with Description of Methods used.

(At 7.30 P.M. the members will dine together at Pagani's Restaurant, Great Portland-street, W., and members may bring guests. Members who wish to dine are requested to send their names to Dr. J. Campbell McClure, 59, Harley-street, W.)

NEUROLOGY (Hon. Secretaries—H. Campbell Thomson, C. M. Hinds Howell): at 8 P.M.

A CLINICAL MEETING will be held at King George Hospital, by kind permission of Lieut.-Colonel Cottell, R.A.M.C.

Friday, Jan. 26th.

STUDY OF DISEASE IN CHILDREN (Hon. Secretaries—A. S. Blundell Bankart, E. A. Cockayne, C. P. Lapage): at 4.30 P.M.

Cases will be shown.

Short Paper:

Dr. J. Porter Parkinson: Pneumonia with Hyperpyrexia followed by Heart Block.

ROYAL SOCIETY OF ARTS, John-street, Adelphi, W.C.

WEDNESDAY.—4.30 P.M., Paper:—Mr. W. A. M. Goode: Relief Work in Belgium.

HUNTERIAN SOCIETY, at the Royal Society of Medicine, 1, Wimpole-street, W.

WEDNESDAY.—9 P.M., Mr. F. Kidd: Demonstration on Surgical Diseases of the Urethra.

LECTURES, ADDRESSES, DEMONSTRATIONS, &c.

POST-GRADUATE COLLEGE, West London Hospital, Hammersmith-road, W.

MONDAY.—2 P.M., Medical and Surgical Clinics. X Rays. Mr. Gray: Operations. Mr. B. Harman: Diseases of the Eye. Dr. Simson: Diseases of Women.

TUESDAY.—2 P.M., Medical and Surgical Clinics. X Rays. Mr. Baldwin: Operations. Dr. Banks Davis: Diseases of the Throat, Nose, and Ear. Dr. Pernet: Diseases of the Skin.

WEDNESDAY.—10 A.M., Dr. Saunders: Diseases of Children. Dr. Banks Davis: Operations of the Throat, Nose, and Ear. 2 P.M., Medical and Surgical Clinics. X Rays. Mr. Pardoe: Operations.

THURSDAY.—2 P.M., Medical and Surgical Clinics. X Rays. Mr. Gray: Operations. Mr. B. Harman: Diseases of the Eye.

FRIDAY.—10 A.M., Dr. Simson: Gynæcological Operations. 2 P.M., Medical and Surgical Clinics. X Rays. Mr. Baldwin: Operations. Dr. Banks Davis: Diseases of the Throat, Nose, and Ear. Dr. Pernet: Diseases of the Skin.

SATURDAY.—10 A.M., Dr. Saunders: Diseases of Children. Dr. Banks Davis: Operations of the Throat, Nose, and Ear. Mr. B. Harman: Eye Operations. 2 P.M., Medical and Surgical Clinics. X Rays. Mr. Pardoe: Operations.

NORTH-EAST LONDON POST-GRADUATE COLLEGE, Prince of Wales's General Hospital, Tottenham, N.

MONDAY.—Clinics:—10.30 A.M., Surgical Out-patients (Mr. H. Gillespie). 2.30 P.M., Medical Out-patients (Dr. T. R. Whipham): Gynæcological Out-patients (Dr. Bainton). 3 P.M., Medical In-patients (Dr. R. M. Leslie).

TUESDAY.—2.30 P.M., Surgical Operations (Mr. Carson). Clinics:—Medical Out-patients (Dr. A. G. Auld); Surgical Out-patients

(Mr. Howell Evans); Nose, Throat, and Ear Out-patients (Mr. C. H. Hayton). Radiography (Dr. Metcalfe). 3.30 P.M., Medical In-patients (Dr. A. J. Whiting).

WEDNESDAY.—Clinics:—2.30 P.M., Throat Operations (Mr. C. H. Hayton). Children Out patients (Dr. T. R. Whipham); Eye Out-patients (Mr. R. P Brooks); Skin Out-patients (Dr. H. W. Barber). 5.30 P.M., Eye Operations (Mr. R. P. Brooks).

THURSDAY.—2.30 P.M., Gynæcological Operations (Dr. A. E. Giles). Clinics:—Medical Out-patients (Dr. A. J. Whiting); Surgical Out-patients (Mr. Carson); Radiography (Dr. Metcalfe). 3 P.M., Medical In-patients (Dr. R. M. Leslie).

FRIDAY.—2.30 P.M., Surgical Operations (Mr. Howell Evans). Clinics:—Medical Out-patients (Dr. A. G. Auld); Surgical Out-patients (Mr. E. Gillespie); Eye Out-patients (Mr. R. P. Brooks).

ST JOHN'S HOSPITAL FOR DISEASES OF THE SKIN, 49, Leicester-square, W.C.

TUESDAY.—4 P.M., Dr. C. Kempster: X Rays. Rodent Ulcer and Malignant Diseases.

THURSDAY.—6 P.M., Chesterfield Lecture:—Dr. M. Dockrell: Vesicular and Bullous Diseases and their Treatment.

ROYAL INSTITUTE OF PUBLIC HEALTH, Lecture Hall of the Institute, 37, Russell-square, W.C.

Course of Lectures and Discussions on Public Health Problems under War and After-war Conditions:—

WEDNESDAY.—4 P.M., Lecture II.:—Dr. Mary Scharlieb: The Prevention and Arrest of Venereal Disease in Women. Dr. C. W. Saleeby, Dr. Jane H. Walker, and Dr. Helen M. Wilson have promised to take part in the discussion.

ROYAL INSTITUTION OF GREAT BRITAIN, Albemarle-street, Piccadilly, W.

TUESDAY.—3 P.M., Prof. C. S. Sherrington: The Old Brain and the New Brain, and their Meaning. (Lecture II.)

EDITORIAL NOTICES.

IT is most important that communications relating to the Editorial business of THE LANCET should be addressed *exclusively* "TO THE EDITOR," and not in any case to any gentleman who may be supposed to be connected with the Editorial staff. It is urgently necessary that attention should be given to this notice.

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Lectures, original articles, and reports should be written on one side of the paper only, *and when accompanied by blocks it is requested that the name of the author, and if possible of the article, should be written on the blocks to facilitate identification.*

Letters, whether intended for insertion or for private information, must be authenticated by the names and addresses of their writers—not necessarily for publication.

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Cases for binding the half-year's numbers (inland edition) are now ready. Cloth, gilt lettered, price 2*s.*, by post 2*s.* 4*d.*

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ALTERATION IN THE PRICE OF "THE LANCET."

INCREASED war expenses and cost of production necessitate an increase of the price of THE LANCET. Commencing with the new year, the price was raised to 8*d.* The rates of subscription remain as revised in October.

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METEOROLOGICAL READINGS.

(Taken daily at 8.30 a.m. by Steward's Instruments.)

THE LANCET Office, Jan. 17th, 1917.

Date.	Rain-fall.	Solar Radio in Vacuo.	Maximum Temp. Shade.	Min. Tem.	Wet Bulb.	Dry Bulb.	Remarks.
Jan. 11	...	42	42	33	36	36	Raining
,, 12	0·15	59	43	36	38	40	Cloudy
,, 13	0·11	51	38	35	34	35	Cloudy
,, 14	...	44	37	33	34	36	Overcast
,, 15	0·01	38	36	33	33	34	Overcast
,, 16	0·02	45	37	32	33	34	Snowing
,, 17	0·10	42	37	34	35	36	Overcast

Other information which we have been accustomed to give in these "Readings" is withheld for the period of the war.

BOOKS, ETC., RECEIVED.

ARNOLD, EDWARD, London.
The Motor Car: What It Is and How to Drive. By T. O. A. Lawton and R. J. Gibson. 1*s.*

BALE, JOHN, SONS, AND DANIELSSON, London.
High Price of Sugar and How to Reduce It. By Harold Hamel Smith. 1*s.* net.

CHAPMAN AND HALL, London.
Food and Fitness, or Diet in Relation to Health. By James Long. 5*s.* net.

GREEN, W., AND SON, Edinburgh and London.
Encyclopædia Medica. Second edition. Under the general editorship of J. W. Ballantyne, M.D., C.M., F.R.C.P.E. Vol. IV., Bar to Filariasis. 20*s.* net.

LANE, JOHN, London and New York. S. B. GUNDY, Toronto.
Cow and Milk Book. By the Hon. Mrs. Lionel Guest. 1*s.* net.

LEWIS, H. K., London.
Practical Bacteriology, Blood Work, and Animal Parasitology. By E. R. Stitt, A.B., Ph.G., M.D. Fourth edition. 9*s.* net.

MILFORD, HUMPHREY, London. OXFORD UNIVERSITY PRESS AND PRINCETON UNIVERSITY PRESS, Princeton.
Critique of the Theory of Evolution. By T. Hunt Morgan, Professor of Experimental Zoology in Columbia University. 6*s.* 6*d.* net.

SAUNDERS, W. B., COMPANY, London.
A Text Book of Pathology. By W. G. MacCallum, M.D., College of Physicians and Surgeons, New York. 35*s.* net.
The Expectant Mother. By S. Wyllis Bandler, M.D., Professor of Diseases of Women, New York Post-Graduate Medical School. 6*s.* net.
Personal Health. By Wm. Brady, M.D., New York Post-Graduate Medical School. 6*s.* 6*d.* net.
Human Physiology. By Percy Goldthwaite Stiles, Assistant Professor of Physiology, Harvard University. 6*s.* 6*d.* net.

YEAR BOOK PRESS, Chicago.
Obstetrics (Practical Medicine Series, Vol. II.). Edited by J. B. de Lee, A.M., M.D., and with the collaboration of H. M. Stowe. $1.35.

The following journals, magazines, &c., have been received:—Eugenics Review, British Journal of Inebriety, Caledonian Medical Journal, Bulletins et Mémoires de la Société Médicale des Hôpitaux de Paris, British Dental Journal, Canadian Medical Association Journal, Dublin Journal of Medical Science, American Journal of Obstetrics, Malaria, Albany Medical Annals, Therapeutic Gazette, Military Surgeon, Revue d'Hygiène, British Journal of Dermatology, Annales de Médecine, Archives de Médecine et Pharmacie Navales, Journal of Comparative Pathology and Therapeutics, Public Health, American Journal of Public Health, Medical Review, Cleveland Medical Journal, Maternity and Child Welfare, Pediatrics, American Journal of Medical Sciences, Surgery, Gynecology, and Obstetrics, Modern Hospital, Nordiskt Medicinskt Arkiv, Archives of Pediatrics.

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